

# **Innovations and Food Chain Actors' Behavior**

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## **Introduction**

A significant amount of interdisciplinary research work has been conducted on the interrelations between innovations and human behavior. The ten papers in this collection contribute to this literature. The papers can be divided into two thematic areas. The first area (part A) compiles contributions studying businesses' compliance behavior and the effects of changing incentives through innovative food regulation measures. The second thematic area (part B) contains papers on the factors affecting the adoption and diffusion of innovation in rural areas.

The papers presented in part A can be further divided into two groups: the theoretical and empirical works. The first group involves theoretical works that analyze the compliance behavior of businesses. In these theoretical papers, we elaborate on the effect of factors that we identified mainly from economic, psychological and criminological theories on the compliance behavior of businesses. Understanding the factors that drive managers' behavior allows for a better understanding of how policy measures work in practice. In the papers in the second group, we use the theoretical findings as a framework for the empirical analysis of compliance behavior of economic agents in the agri-food industry with regulations intended to increase food safety. The empirical evidence on the possible drivers of compliance behavior in the agri-food sector is as yet rather rudimentary. Based on the findings regarding the factors affecting compliance behavior, we analyze the capacity of the disclosure of hygiene results - an innovative policy measure being used in Germany to increase compliance.

The second thematic area (part B) contains papers analyzing the factors affecting the adoption and diffusion of innovation in rural areas. We make an effort to better understand the drivers behind the implementation of environmentally friendly innovations in Germany and Russia. In Germany, we investigate farmers' willingness to implement agri-environmental measures and innovations, as well as consumers' willingness to buy products from innovative marketing channels (e.g., directly from farmers). In Russia we analyze the agricultural labor supply, and find that the exodus of young, educated people and brain drain

in rural areas may hinder the implementation of modern, environmentally-friendly technologies in agriculture.

## **A - Food Businesses Compliance Behavior and Innovative Regulations**

Over recent decades, consumers and policy makers have become increasingly concerned about food quality and safety. Indeed, consumers and policy makers alike call for more efforts to identify the failures in food markets to mitigate the corresponding credence quality problems and food risks. Despite a growing societal awareness of malpractices in food production, there is a lack of applied behavioral analyses of food businesses that consider the individuals' multiple goals. Trying to fill this gap, the papers in part A investigate the problem of behavioral risks in economic relationships and the mitigation of behavioral risks through appropriate policies. In papers A-1 to A-3 we develop a theoretical background that we use in empirical papers A-4 to A-6 to analyze the behavior of food supply chain actors.

### **Theoretical Contributions**

The theoretical papers A-1 to A-3 are motivated by two fundamental research questions: first, what are the economic agents' behavioral drivers? Second, how should the policy measures be designed to effectively increase law compliance?

For analytical convenience, many researchers do not consider non-material motivations when analyzing people's behavior. However, some conceptual developments view people's choices as being motivated by material and non-material goals (e.g., Arrow, 2000; Pistrup-Andresen, 2005). Other researchers include non-material motivations such as fairness and inequity aversion in formal utility modeling (e.g., Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999; Fehr et al., 1998). Still other researchers stress that non-material motivations should be considered in a comprehensive analysis that considers both the material payoffs and the non-material costs (disutility) and benefits (utilities) associated with individual choices (e.g., Frey and Stutzer, 2007; Ostrom, 2005).

To determine the drivers of economic agents' behavior we use an interdisciplinary approach based on economics, criminological, sociological and psychological studies to better understand compliant/non-compliant behavior. Our theoretical work systematically integrates both the material and non-material determinants of behavior identified by the above mentioned disciplines that need to be considered in a comprehensive analysis of behavioral food risks.

Material benefits from rule-breaking may result from cost savings generated by ignoring environmental, hygienic or occupational safety directions. The expected sanctions depend on two parameters: (i) the sanction level that the actor expects, and (ii) the probability of the expected sanctioning. The probability of an offence being sanctioned is determined by the intensity of monitoring by other actors in the supply chain or by public food inspection, as well as by the effectiveness of whistle-blower systems. Non-material factors are associated with social control and internalized norms that encourage compliance and are termed protective factors. "Protective factors are characteristics in individuals and/or their socio-economic environments that discourage actors from rule-breaking by causing nonmaterial benefits (utility) in the case of compliance and nonmaterial costs (disutility) in the case of non-compliance," (Hirschauer and Scheerer 2014). This reflects the common knowledge that people tend to pursue multiple goals and endeavor to achieve not only wealth but also social recognition, as well as maintain consistency with their internalized values (Zack, 2011; Stringham, 2011; Lösel and Bender, 2003; Akerlof and Kranton, 2005).

Regarding the second question of how policy measures should be designed to effectively increase law compliance, we elaborate on the prerequisites of smart regulatory approaches. While understanding of the factors that determine behavior is essential for analyzing the regulatory status quo and identifying existing compliance problems, it is also important to be aware of the motivational changes that are likely to be brought about by regulatory innovations. These include the following:

- Regulatory innovation may increase both extrinsic and intrinsic motivation to comply. Such a desirable interdependency has been termed "crowding-in" (e.g., Frey, 1997).

- Regulatory innovation may enhance extrinsic motivation (e.g., through controls and monetary incentives) but it weakens intrinsic motivation. Such dysfunctional effects have been termed “crowding-out” (e.g., Frey, 1997).
- Regulatees may consider the new regulatory measures to be illegitimate, which may generate reactance (e.g., Miron and Brehm, 2006). That is, non-compliance may become an intrinsic source of utility and the regulatees may even accept economic disadvantages to retain their freedom of action by breaking rules that they deem illegitimate.

Regulators should, consequently, consider the interactions between extrinsic and intrinsic motivations and search for interventions that, at best, generate a crowding-in effect.

**A-1 Hirschauer, N., Bavorová, M. and Martino, G. 2012. An Analytical Framework for a Behavioural Analysis of Non-compliance in Food Supply Chains** (British Food Journal 114: 1212-1227)

The paper analyses the multiplicity of behavioural factors influencing producers’ motivation to intentionally violate food safety norms. We review existing disciplinary approaches for the analysis of behavioural risks. Based on this review, an analytical framework is developed which provides a base for an interdisciplinary institutional analysis of behavioural risks in food chains. The reviewed approaches on behavioural risk share the view that deviance is the result of multi-goal and (potentially) opportunistic decision-making of bounded rational individuals. The analytical framework presented in this paper integrates these approaches. A behavioural economic analysis based on the framework means opening up the black box of the regulatees’ action situation by incorporating the subjectively perceived material incentives in addition to immaterial motivations such as reputation effects, social norms and community pressure into the analysis. Based on an understanding of producers’ motivation, proper institutional solutions can be implemented to enhance producers’ compliance with food safety norms.

**A-2 Hirschauer, N. and Bavorová, M. 2014. Advancing Consumer Protection through Smart Food Safety Regulation** (European Food and Feed Law Review 1: 91-104)

The reduction of food risks that are caused by malpractice requires the reconstructing understanding of the context-dependent behaviours of food businesses and a corresponding design of adequate governance structures. Concerning ourselves with consumer protection, in the paper, we focus on the question which behavioural drivers need to be considered when designing “smart” regulatory regimes that effectively and cost-efficiently foster compliance with food quality and safety rules. Doing so, we link the concept of smart regulation with the concept of risk analysis according to General Food Law (EC regulation 178/2002). While a systematic comparison of the smartness of concrete consumer protection policies is beyond the paper’s scope, we furthermore briefly discuss disclosure policies for two reasons: first, name-and-shame schemes are increasingly used by food authorities in various countries. Second, they seem to be promising candidates for smart consumer protection policies from a regulatory theory point of view as food markets are riddled with information asymmetries.

**A-3 Bavorová, M., Hirschauer, N. and Martino, G. 2014. Food Safety and Network Governance Structure of the Agri-food System, Editorial of Special Issue: Food Safety and Network Governance Structures (European Journal of Law and Economics 37: 1-11)**

In the paper, we discuss the food safety in food supply chains and the smart regulation mechanisms for good quality and safety. The regulation of food businesses will only be smart if it meets two conditions: first, regulatory strategies can only be applied successfully if they are viable within a nation’s legal and constitutional environment. Second, smart regulation has to be effective in that it changes the behaviour of food businesses in a significant way and in the direction intended by the regulator. From the perspective of a food authority, effective strategies are those that produce compliant behaviour, thus improving food quality and safety and guaranteeing the free and informed choice of consumers. To be effective, regulation must be based on a realistic behavioural model in which the relationships between the actors’ behavioural determinants and their behaviours are adequately considered. Instead of focusing exclusively on material incentives, this requires a holistic approach which is aware of crowding-out and reactance problems and consistently combines measures that reduce misdirected incentives with measures that strengthen the



actors' bonds to social norms. Any attempt to make an isolated impact on material incentives runs the risk to backfire. Adopting a broad utilitarian view according to which human behaviour depends on multiple motivations, such a holistic approach can be understood as a strategy which aims to get the utilities right that are subjectively expected by multiple-goal, and eventually bounded-rational, actors. The conception of economic man underlying the change from the famous "get incentives right" to the more adequate "get utility right" is the key to understanding what the regulatory issue is essentially about.

### **Empirical Contributions**

Since applied research on what makes producers break (or follow) rules in the context of the food supply chain are still lacking, knowledge gaps persist regarding the design of effective regulatory enforcement strategies. To close this research gap, in papers A-4, A-5 and A-6 we identify and discuss the factors to consider when designing regulatory regimes that effectively and cost-efficiently foster compliance with mandatory food safety rules. We use our theoretical contributions as the theoretical framework.

Some attempts have been made to analyze the regulation of food safety and quality. For example, Hobbs et al. (2002) focused on incentive-based approaches to food safety and quality assurance systems. Lippert et al. (2014) applied economics of crime theory to explain non-compliance. These authors derive a theory for noncompliance by modeling the decision of an opportunistic and/or careless organic farmer and analyze the factors that may help regulate food quality and safety. Further, Yapp and Fairman (2006) studied factors affecting food safety compliance within small and medium-sized enterprises.

In the empirical papers we analyze the impacts that food inspection results have on disclosure systems regarding food business behavior in Germany. Disclosure is an innovative regulatory measure and only a few pilot transparency schemes have been introduced in Germany. Currently, the only transparency system is organized by the administrative district of Osnabrück. Due to concerns about whether or not the German consumer information law provides a sufficient legal basis for compulsory disclosure, no mandatory transparency

system for food businesses is in place. The “Pankower Smiley” pilot project was the only mandatory transparency system, but it was put on hold due to inadequate statutory legal basis in 2014.

Disclosure is critically discussed in the previous literature (e.g., van Erp, 2007, 2011). Weil et al.'s (2006) comparison of the effectiveness of publishing systems from different sectors shows that the publication of inspections clearly resonates with restaurants. This means that in the restaurant sector, the transparency policy has changed the behavior of most users and disclosers in a significant way and in the direction intended by policy-makers. This finding supports results from Toronto, Canada, where compliance with regulatory requirements increased from 78% in 2001 to 88% in 2003 due to the disclosure of inspection results (Thompson et al., 2005). Jin and Leslie (2003) describe the effect that publishing hygiene inspection reports has on restaurant income in Los Angeles. These authors observed an improvement in hygiene and a reduction in food-related hospitalizations. In an empirical study in San Diego and New York, however, Ho (2012) finds that regulatory design, as well as the implementation and practice of transparent systems all suffer from serious flaws, and the systems are thus not effective at decreasing the rate of food-borne illnesses. To our knowledge, there has been no research on how the disclosure of hygiene results affects material and nonmaterial behavioral drivers, and thus compliance behavior.

**A-4 Bavorová, M. and Hirschauer, N. 2012. Producing Compliant Business Behaviour: Disclosure of Food Inspection Results in Denmark and Germany** (Journal für Verbraucherschutz und Lebensmittelsicherheit 7: 45-53)

With a view to the current dioxin scandal and the political discussions regarding the introduction of a public disclosure system in Germany, in the fourth paper in this section, we carry out a comparative analysis of the well-established Danish smiley scheme and three pilot projects in Germany. Aiming at identifying the potential for improvement, we address the variability of the institutional design of these transparency systems as well as their effectiveness and costs. In the last decade public disclosure of food inspection results (“name-and-shame”) has been increasingly used by authorities to promote compliance with food regulations. Name-and-shame measures tackle the problem of market failure by

increasing transparency, strengthening the sovereignty of consumers and enabling them to make informed choices. Consumers prefer to buy from compliant food businesses. If information on compliance is successfully provided to and widely perceived by consumers, businesses which fail inspection will face a competitive disadvantage. They will be sanctioned not only by the state but also by a loss of market share. Additionally, social sanctioning from “relevant others”, such as friends and regular customers, may be favourably linked with market sanctions. Both economic and social sanctions further the motivation of food businesses to comply. Name-and-shame measures are thereby expected to effectively increase compliance with food regulations while keeping costs low for tax payers. Regulatory strategies which are both effective and cost-efficient are said to be smart. A prerequisite of smart regulatory solutions is that they are legally viable within a nation’s legal and constitutional environment.

**A-5 Fietz, A. and Bavorová, M. 2015. Die Wirkung der Veröffentlichungen von Hygienekontrollen auf die Lebensmittelunternehmen – Das Beispiel des Berliner Smiley (Journal für Verbraucherschutz und Lebensmittelsicherheit 11: 1-10)**

In this paper we analyze the effect of especially non-material behavior drivers on the decision making of food producers. Such an analysis is topical in Germany against the background of the current discussion about transparency systems. To be able to assess the effect of the so called “Smiley systems” we conducted a survey among the food businesses in Berlin Pankow, Lichtenberg and Marzahn-Hellersdorf. These Berlin boroughs implemented a unique pilot project in Germany. In this pilot project they introduced an obligatory publication of the results of food hygiene controls. We use a generalized ordered logit models to test the effect of the behavior drivers on regulatory compliance (dependent variable) according to food business type (restaurants or others). In our model, the feeling the received smiley is fair is a positive significant factor for compliance for both business types groups.

**A-6 Bavorová, M. Fietz, A. and Hirschauer, N. 2016. Does Disclosure of Food Inspections Affect Business Compliance? The Case of Berlin, Germany (British Food Journal, accepted)**

A whole series of food scandals indicates that misdirected incentives continue to be a source of food risks. Lacking market transparency and the opportunistic use of seemingly profitable opportunities to break the rules cause negative externalities and the failure of markets. In the paper, we investigate the influence of mandatory transparency schemes on food businesses' behavioural drivers and thus on compliance. We use an adopted analytical framework developed by Hirschauer et al. (2012) as theoretical background. We provide an empirical analysis of the effects of a disclosure system on businesses' behavioural drivers in three urban parts of the German capital Berlin. We conducted a pen and paper survey among food businesses to collect data and used a generalized ordered logit regression model to analyse them. The results show that the higher the businesses assess the possible negative effects of a negative smiley on sales the higher the probability of compliance. Considering the immaterial behavioural drivers (protective factors) we find statistical significant influence of a feeling of embarrassment in case of disclosure and the feeling of a fair evaluation on compliance. Thus, our study supports the expectation that disclosure policies affect behavioural drivers and have the potential to steer food businesses' compliance. Our study supports the expectation that hygiene controls' disclosure positively affects food businesses' compliance. These findings should be taken into consideration in the ongoing discussion about disclosure. Nowadays, there is no mandatory transparency in Germany due to a strong opposition among businesses and their lobbying groups, and some political parties.

## **B - Factors Affecting the Adoption and Diffusion of Innovation in Rural Areas**

The papers in section B are rather heterogeneous at first glance. A deeper examination allows us to identify the common denominator, namely that all of these papers analyze factors affecting innovation adoption and diffusion in rural areas.

Innovations are considered an engine of firms' competitiveness, and thus as a driver of economic development. In the "Guidelines for Collecting and Interpreting Innovation Data," (OECD 2005, p. 46)), innovation is defined as follows: "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing

method, or a new organizational method in business practices, workplace organisation or external relations...The minimum requirement for an innovation is that the product, process, marketing method or organisational method must be new (or significantly improved) to the firm. This includes products, processes and methods that firms are the first to develop and those that have been adopted from other firms or organizations," (EU SCAR, 2012).

Previous studies point to the main factors that influence the adoption of innovative environmental farming practices, which include: the characteristics of a farm and farmers (Crabtree, Chalmers, and Barron, 1998; Wynn, Crabtree, and Potts, 2001); attitudes and perceptions towards conservation practices (Black and Reeve, 1993; Defrancesco et al., 2008; Vanslebrouck, Van Huylenbroeck, and Verbeke, 2002); financial factors (Morris and Potter, 1995; Wilson and Hart, 2000; Sutherland et al., 2012); the institutional design and the requirements of policy measures (Polman and Slangen, 2008; Dupraz, Latouche, and Turpin 2009); and information and communication (Lowe and Cox, 1990; Morris and Potter, 1995; Warriner and Moul, 1992; Skerratt, 1998).

In papers B-1 and B-2 we analyze information and communication. Paper B-1 analyzes how communication affects the adoption of agri-environmental measures by organic farmers in Germany. In paper B-2, we investigate what drives the innovativeness of both organic and conventional farmers in Germany and how important the use of various information sources is to their adoption of innovation. Knowledge of the effect between communication and the behavior of innovative farmers helps create appropriate policy measures for supporting innovative behavior.

The economic success of innovative marketing channels such as selling at the farmers' market or farm shop depends on consumer acceptance. This motivates paper B-3, which investigates factors that affect the probability of consumers to buy at the farm. Internationally, the growing market for local products has engendered increasing scholarly interest in consumers' perceptions of and attitudes toward direct marketing, as reflected by the increasing number of studies published on this topic, especially in North America (e.g., Wirthgen, 2005; Bond, Thilmany, and Bond, 2006; Zepeda and Li, 2006; Thilmany, Bond, and

Bond, 2008; Cranfield, Henson, and Blandon, 2012; Adekunle, Filson, and Sethuratnam, 2013) but also in the EU (e.g., Wirthgen, 2005; Roininen, Arvola, and Lähteenmaki, 2006; Chambers et al., 2007; Rocchi, Cavicchi, and Baldeschi, 2011). However, in the EU such consumer studies remain rare, while the differences between EU countries regarding direct marketing and consumer behavior remain significant (Vecchio, 2011).

Directly-sold food is generally considered local food; however, food does not have to be sold directly by farmers to be considered local. Thus, some studies that investigate the effects of attitudinal and socio-demographic factors on consumers' likelihood to buy local food neglect the effect of distribution channels. Our study contributes to the literature by investigating the effect of distribution channels and comparing the influence of socio-demographic characteristics and perceived product attributes on consumers' purchase frequency in two market outlets: farmers' markets and farm shops (located on farms).

One of the most important prerequisites for innovation adoption is skilled labor. This may sometimes prevent innovation adoption and diffusion, especially in rural areas affected by "brain drain". In paper B-4, we tackle the out-migration of educated youth from rural areas in Siberia. Much is already known about youths' migration decisions. For example, Garasky (2002) found that non-economic factors play an especially important role in the migration of youth from rural areas, whereas Stockdale (2006) found that economic factors, especially overall high unemployment rates, are decisive factors in the out-migration of youth from the Scottish study area. Garasky (2002) also identified the local economy and labor market as being important factors in migration decisions. Further, the findings of Thissen et al. (2010) are consistent with those of the aforementioned studies and note that the migration intentions of young rural people are significantly related to both hard structural factors (i.e., the availability of jobs) and soft cultural factors (i.e., a feeling of being at home). Other factors that have been found to influence migration decisions include quality of life, employment expectations and the characteristics of young people, their homes and the local community environment (Garasky, 2002; Corbett, 2005; Thissen et al., 2010; Mihi-Ramirez and Kumpikaite, 2014). Studies investigating this issue in Russia are very rare, however. We

aim to close this gap and investigate the factors that affect the outmigration in Altai krai in southeast Siberia, an agricultural area that suffers from a lack of specialists willing to work in agriculture.

**B-1 Unay Gailhard, I., Bavorová, M. and Pirscher, F. 2014. Adoption of Agri-Environmental Measures by Organic Farmers: The Role of Interpersonal Communication (The Journal of Agricultural Education and Extension 21: 127-148)**

The purpose of the study is to investigate the impact of interpersonal communication on the adoption of agri-environmental measures (AEM) by organic farmers in Germany. The study used the logit model to predict the probability of adoption behaviour, and Social Network Analysis (SNA) was conducted to analyse the question of whether validating information about organic farming provided by interpersonal information sources is associated with communication frequency. Our findings demonstrate that being an early adopter of organic farming practices and frequent contact with young and highly educated farmers increases the probability of adoption of other AEM. However, contact frequency in interpersonal networks was found not to be a significant determinant for explaining adoption decisions. Frequently-communicating farmers in the network are more likely to attribute higher levels of importance to organic farming information received from formal actors than to information received from informal actors. If young and highly-educated farmers, who can be considered as informal opinion leaders, are approached by the extension services, then an effective diffusion of information on AEM can be expected. To support the AEM adoption, a platform should be provided by state agencies that would enable organic farmers to understand the environmental benefits achieved over the time. This study contributes to the scientific discussion on the role of interpersonal communication on AEM adoption. A new aspect is our consideration of organic farmers adopting additional AEM. Moreover, we highlight organic farmers' validation of the importance of formal and informal information sources on organic farming.

**B-2 Unay Gailhard, I. and Bavorová, M. 2014. Innovation at Rural Enterprises: Results from a Survey of German Organic and Conventional Farmers (Technology & Innovation 16: 3-17)**

The main objective of the article is to examine the influence of interpersonal networks on the innovativeness of farmers. The study focuses on two types of farmers' network ties: friendship ties (ties to other farmers) and affiliation ties (ties to associations). Additionally, the importance of information gathered by farmers from interpersonal sources and from media is compared. We collected data within the EU-funded FOODIMA project using face-to-face interviews. Our sample, which consists of 72 farmers (organic and conventional) in Germany, was used to map farmers' innovativeness (number of innovations adopted). We use the logit and OLS regression models to find out if the structure and strength of network ties can be used as predictors of innovativeness for organic and conventional farmers. When considering both the friendship and affiliation ties, the main results show that organic farmers who communicate more frequently with other farmers are more likely to be highly innovative. The large network size indicates low innovativeness on the part of organic farmers. Membership in at least one association is positively interconnected with high innovativeness of conventional farmers. Regarding information sources, the results indicate that highly innovative farmers appreciate information from research institutes more—and information from agricultural organization less—than less innovative farmers.

**B-3 Bavorová, M., Unay Gailhard, I. and Lehberger, M. 2015. Who Buys from Farmers' Markets and Farm Shops: The Case of Germany (International Journal of Consumer Studies 40: 107-114)**

In the article, we analyze the influence of socio-demographic factors and consumer attitudes toward direct marketing products and sources (outlets) on the frequency of buying food from farmers' markets and farm shops. By conducting an intercept survey with pedestrians in 2011 and 2012, we interviewed a total of n=550 consumers. The target regions of the study were the Eastern German federal states. The study employs two ordered logit regression models to investigate consumers' shopping behavior at farmers' markets and farm shops separately. We find that different factors significantly influence consumers' buying behavior at the two direct marketing outlets. Specifically, both a more favorable view toward the freshness of directly marketed foods and the intention to support local producers are positively related to consumers' purchase frequency from farmers' markets. In



contrast, consumers' purchase frequency from farm shops is significantly influenced by their perception of the cost of the products, confidence in food producers of directly marketed products, perception of the safety of the food and perception of the accessibility of farm shops. The study results indicate that considering consumer behavior separately for different direct marketing channels for food rather than considering the entire category of local food outlets may provide new and valuable insights.

**B-4 Bednaříková, Z., Bavorová, M. and Ponkina, E. 2016. Migration motivation of agriculturally educated rural youth: the case of Russian Siberia** (Journal of Rural Studies 45: 99-111)

The migration of young people from rural areas is common in all agricultural regions of Russia, and Altai Krai, located in southwestern Siberia, is no exception. Out-migration, aversion to working in agriculture and the aging of farmers and farm managers are serious problems that raise questions about who will work in agriculture in the future. The paper aims to investigate factors that affect the decisions of agricultural students from Altai Krai to out-migrate or to return to their rural parental municipalities after finishing their university studies. We conducted a questionnaire survey of students at the Altai State Agrarian University in Barnaul and analyzed their migration intentions using a logit regression model. Migration motivation is studied in relation to personal and family background characteristics, employment expectations and quality of life, with a particular focus on references to agriculture. Our results show that the probability of leaving the parental municipality decreases if i) the respondent's parents support the study of agriculture, ii) the respondent's family owns agricultural land, iii) the respondent intends to work in agriculture, and iv) the respondent believes that it is not difficult to establish one's own business in the parental municipality. Women are more likely than men to leave their rural parental municipalities, and the probability of out-migration increases as respondents' life satisfaction increases. Our findings indicate that agricultural roots in the respondent's family stimulate young university graduates to return home and continue in the family tradition. Some of the factors that push young people, especially women, to out-migrate to cities (such as territorial isolation or the social roles of rural women) may be changed only over a long-

term period. The recovery or enhancement of relationships between agricultural schools and agricultural enterprises, access to credits for business establishment and the purchase of agricultural land, and better living conditions in rural municipalities could encourage agriculturally educated youth to remain in rural areas and work in agriculture.

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# An analytical framework for a behavioural analysis of non-compliance in food supply chains

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## Abstract

**Purpose** – Business malpractice in supply chains raises the food safety risks for downstream buyers, including consumers. This paper aims to analyse the multiplicity of behavioural factors influencing producers' motivation to break the food safety norms intentionally.

**Design/methodology/approach** – The paper reviews existing disciplinary approaches for the analysis of behavioural risks. Based on this review, an analytical framework is developed which provides a base for an interdisciplinary institutional analysis of behavioural risks in food chains.

**Findings** – The reviewed approaches on behavioural risk share the view that deviance is the result of multi-goal and (potentially) opportunistic decision making of bounded rational individuals. The analytical framework presented in this paper integrates these approaches.

**Research limitations/implications** – The analytical framework provides a rough categorisation of behavioural drivers. It neither details the context-dependent subcomponents that determine the utility outcome within each category nor the methods that should be used to analyse them.

**Originality/value** – A behavioural economic analysis based on the framework means opening up the black box of the regulatees' action situation by incorporating the subjectively perceived material incentives in addition to immaterial motivations such as reputation effects, social norms and community pressure into the analysis. Based on an understanding of producers' motivation, proper institutional solutions can be implemented to enhance producers' compliance with food safety norms.

**Keywords** Behavioural risk management, Food quality, Moral hazards, Supply chain management, Food safety, Risk analysis

**Paper type** Conceptual paper



## 1. Introduction

In the last decades, a wide range of food scares was reported throughout the EU (Knowles *et al.*, 2007). Food safety risks stemming from production may be caused by technological hazards, i.e. a genuine lack of knowledge about the stochastic effects of complex production systems or by technical failures. Food safety risks may also be caused by moral hazard, i.e. by deviant economic behaviour (cf. Entorf and Spengler, 1998; Friedrichs, 2010; Sutherland, 1949, 1979) of self-interested actors who intentionally break contractual and/or legal rules such as those aimed at protecting consumers' health.

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In the German food sector, empirical evidence for non-compliance has been found in many instances. One example is the meat sector, which was riddled with media reports on rotten meat incidents in 2006 and 2007. Other examples are the nitrofen scandal in 2002 when residues of the banned herbicide nitrofen were detected in organic products (Institute for Economic Research and Policy Consulting, 2002), or the pesticide residues detected in the fruit and vegetables of a large retail company in 2005 (Schulze Althoff *et al.*, 2007).

Food producers might, for example, exploit the fact that, due to information asymmetries, neither their production activities nor the resulting food properties can be directly observed by buyers. Price spreads for different quality categories and/or the costs of compliance with public and/or private quality and safety standards may tempt self-interested producers to exploit consumers' lack of information. The probability that quality and safety threats or other undesired production outcomes are caused by malpractice rises in line with the profits that can be earned from opportunistic acts. Hennessy *et al.* (2003) as well as Unnevehr and Jensen (2005) posit that misdirected incentives are a major source of food risks and that there are relevant constellations in food supply chains where non-transparent markets and ill-enforced rules make non-compliance more profitable than compliance. In conjunction with opportunism, this gives rise to negative externalities and the failure of markets where deviant actors outperform their rule-abiding competitors.

Even though the probability of malpractice can be conceptualised as varying with its expected economic benefits, there may be different reactions to identical economic incentives in the sense of expected earnings. On the one hand, risk-averse economic actors are prepared to pay a risk premium. On the other hand, multi-goal decision-makers with social preferences may be prepared to pay an ethical premium. As a consequence, risk aversion as well as bonds to social norms such as values, emotions, etc., may shield actors from deviance despite existing economic temptations to break the rules. From a rational choice point of view, such bonds can be seen as limiting the actor's freedom to break the rules (Tittle, 2000). They can also be viewed as forming the non-economic components of the actor's preference function (e.g. ones influenced by altruism). Depending on the situation, utility gains from complying with rules may (or may not) outweigh temptations to break them (cf. Pinstrup-Andersen, 2005). Such a broad utilitarian view is equivalent with the rationale that complying or non-complying behaviour depends on:

- the physical "opportunities for opportunistic rule-breaking";
- the expected economic benefits associated with these opportunities after the consideration of risk; and
- the utility-relevant values and social context factors that may make producers comply despite contrary economic incentives (Nooteboom, 2004).

The relative invisibility of economic misconduct in conjunction with its ambiguous criminal status and the diffuse responsibility allow offenders to see themselves as honest/respectable persons by rejecting any charge that they are personally responsible or that a harm is done (cf. Szwajkowski, 1992). In connection with this, bonds to social norms such as values, emotions, community pressure etc. that back up the rules (cf. Lösel and Bender, 2003) and act as protective factors tend to be weak. This applies especially to corporate misconduct if none of the executives is individually



accountable. The lack of protective factors is enhanced if misconduct causes “only” an increased probability of adverse outcomes, and if these outcomes are disputable or if they constitute “only” fraud without anybody suffering a “real damage” (e.g. mislabelling regarding a product’s geographic origin or its weight).

Despite a growing societal awareness of substandard food production practices and crimes against consumers, there is a lack of applied behavioural analyses that consider the individual’s multiple goals and the interacting situational factors. Instead of focusing on objective facts and wealth-maximising actors, the understanding of the phenomenon “misconduct” requires that the actors’ options of choice and their calculi are reconstructed according to their subjective preferences, perceptions and evaluations (reconstructing understanding). In other words, multi-goal decision-making, including utility gains from complying with social norms, as well as bounded rational behaviour (cf. Simon, 1956, 1957) need to be included in the analysis (Selten, 1990). With a specific regard to game theory, Rubinstein (1991) states correspondingly that “a good model in game theory has to be realistic in the sense that it provides a model for the perception of real life social phenomena. [...] It should incorporate a description of the relevant factors involved, as perceived by the decision-makers. These need not necessarily represent the physical rules of the world”. Instead, one needs a subjective and bounded rational choice model which tackles the gap between rational choice predictions and actual behaviour (cf. Garoupa, 2003) and which reflects behaviour as a result of what the individual sees as procedurally reasonable in the light of the available information and his information-processing capacities (cf., for example, MacLeod, 2003; Simon, 1986). It should consequently consider the individual’s risk assessments as well as his selfish and altruistic preferences and the trade-offs between them (cf., for example, Margolis, 1982). Since applied studies of what makes food producers break (or not break) rules in the economic and social contexts of their respective supply chain are as yet scarce, knowledge gaps persist regarding effective supply chain management as well as regarding the institutional design of effective regulatory strategies.

The main contribution of the analytical framework proposed in this paper for future analyses in the food quality and safety domain is that it shows what needs to be studied in a behavioural economic analysis. It provides a point of departure for future empirical studies that are better able to inform us how successful food supply chains and food safety institutions are in adequately steering the behaviour of food business operators.

Given this background, section 2 gives a brief overview of various contributions (both from the economic and the social sciences) that have been made to the study of behavioural economic risks. In section 3, we develop an analytical framework for the study of behavioural risks. Section 4 concludes with an outlook of how the framework can contribute to an interdisciplinary analysis of the institutional performance of (food) supply chains regarding the mitigation of behavioural risks.

## **2. Disciplinary contributions to the analysis of economic misconduct**

### *2.1 People’s motivations in general*

A crucial assumption of neo-classical theory is that economic agents behave rationally and maximize their expected utility function in decisions. Many empirical and experimental studies show, however, that human behaviour often deviates from the

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prediction of narrow rational choice theory. Institutional economists argue that economic agents aim to behave rationally but can not do so because of bounded rationality. The reason for bounded rationality is mainly seen in limited information and cognitive capacities (Simon, 1956, 1957). Another reason for the deviation from the narrow rational choice model is that people may have pro-social motivations. In the last decades, there is a growing body of work by economists on pro-social behaviour (for an overview, see Meier, 2007) as well as on incomplete contracts and trust in economic relationships and social networks (theory of trust; cf., for example, Coleman, 1988; Granovetter, 1985; Stephenson, 2006). This work views people's choices as being motivated by material and non-material motivations (cf., for example, Arrow, 2000; Frey, 1990; Pinstrip-Andersen, 2005). It could be shown that significant number of people possess non-material motivations such as altruistic preferences and notions of fairness and reciprocity (cf., for example, Camerer, 2003; Chen, 2000; Fehr *et al.*, 2001).

For analytical convenience, many economic analysts abstract from non-material motivations. Others stress that incomplete contracts that leave some scope for self-interested decision may be superior if people are guilt-averse and if fairness and reciprocity constitute a part of their utility function. Trying to explain experimental and field evidence that contradicts axiomatic game theoretic predictions, some researchers include non-material motivations such as fairness and inequity aversion into formal utility models (cf., for example, Bolton and Ockenfels, 2000; Fehr and Gächter, 1998; Fehr and Schmidt, 1999). Others stress that they should at least be considered in a comprehensive analysis, which not only considers material payoffs, but also non-material psychological costs (disutilities) and benefits (utilities) associated with economic action (cf. Frey and Stutzer, 2007; Ostrom, 2005). Regarding the preference function, attention is directed towards links between material and non-material motivations and evidence is provided that more complete contracts may evoke defiance, thus crowding out positive intrinsic motivation (for an overview of crowding out theory, see Frey and Jegen, 2001; but also Fehr and Rockenbach, 2003; Ostrom and Walker, 2003).

### *2.2 People's motivations for compliance*

Following the seminal work by Becker (1968, 1982), who has provided an explanation for rule-breaking behaviour in terms of economic theory (i.e. by using neoclassical micro-economics to explain areas of behaviour usually held beyond the scope of economics), a wide range of economic literature on deviance has evolved. The microeconomic state of the art regarding problems linked to information imperfections, conflicting interests and opportunism is characterised by a wealth of game-theoretic literature on moral hazard and incentive problems, which are also known as principal agent (PA) problems. A general introduction and overview of PA literature can be found, for example, in Grossmann and Hart (1983), Kreps (1990), Mirlees (1999), or Rasmusen (1994). Moral hazard problems have been studied for a long time and in a wide variety of contexts. This includes transactions involving products with credence qualities (e.g. Akerlof, 1970; Stiglitz, 1987).

Drawing on formal game theory, PA models represent relational risks as games with uncertain and asymmetric information (cf., for example, Kreps, 1990). One assumes that one player (principal) knows the behavioural characteristics (i.e. the set of choices, the utility function, etc.) of the other player (agent) who performs a task on his

behalf (game of complete information). The principal is not able to observe the agent's efforts and actions directly. However, he is considered to be the decisive player in that he is the one who offers a contract to the agent and who takes account of the agent's expected response strategy when designing the contract. The principal is assumed to design the contract upon the rationale that, given opportunities for rule-breaking (or low efforts), the agent will not comply (or exert low efforts) if he can thereby profit (individual rationality). "This situation may be viewed as a noncooperative game in which a strategy for the principal consists of a choice of a fee schedule [i.e. a contract with controls and enforceable clauses] granting specified payments for specified outcomes" (Weiss, 1995). Formal PA models are used to study how to design incentive-compatible contracts that induce the desired behaviour on the part of the agent. Such contracts represent equilibria in that neither player would be better off by choosing an alternative strategy.

In the criminological sciences, two conceptions of deviant man can be distinguished. The first one can be described by the research question being asked as to why people break rules. Consequently research is focused on criminogenic factors that make deviant (groups of) individuals different from non-deviant ones. Examples are deviant acts being explained as a result of personal defects (cf. Lombroso, 1878), deficiencies/disorders (e.g. Smith and Thornberry, 1995), life-course learning (e.g. Conger and Simons, 1997), strain relief (e.g. Agnew, 1999), or identity construction (e.g. Kaplan, 1995). The second one asks the opposite question as to why people obey rules (cf. Tyler, 1990). Consequently research is focused on "protective factors" that support the rules and can be seen as the immaterial behavioural determinants that shield actors from deviant acts despite multiple chances of obtaining profit from them (cf. Coleman, 1988).

Protective factors may take intrinsic forms (internalized values) or extrinsic forms (anticipated social disapproval). They may result from shared values in a society (macro level) or a particular social group such as a firm with a law-abiding organizational culture (meso level). In the last two decades, this has been increasingly understood and termed as "social capital" (cf., for example, Arrow, 2000; Coleman, 1988; Putnam, 1995). They may also arise from empathy and identification resulting from tested personalized relationships and the value of such relationships itself (micro-level). The underlying rational choice accounts in conjunction with control theories (cf. Hirschi, 1969; Tittle, 1995, 2000) understand deviance as a social fact, the emergence of which is due to the "natural inclination" of man towards self-interested behaviour and the (inevitability of) gaps within the system of formal and informal social control (Gottfredson and Hirschi, 1990).

It is important to stress that the explanatory power of different conceptions of deviant man depends on the situational context. Youth gang violence, for example, is different from a breach of industrial safety standards aimed at saving costs. Different normative schools without always stating the context they have in mind, or even claiming panhuman validity – attribute different levels of importance to material and immaterial motivations. In the words of Murphy (2004), one can state that there is a division "between those who think that individuals and firms will comply with rules and regulations only when confronted with harsh sanctions and penalties, and those who believe that gentle persuasion and cooperation works in securing compliance with the law". In addition to the physical incapacitation model of regulation, this antithetic

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pairing has been labelled the deterrence versus the accommodative (or: compliance) model of regulation (cf. Picciotto and Campbell, 2002). If one adds physical target hardening to physical incapacitation (which both reduce the criminal opportunities) and if one associates deterrence not only with criminal sanctions but with all incentive measures that reduce the relative competitiveness of rule-breaking, the three basic regulatory models from criminology (incapacitation/target hardening, deterrence, accommodation) can be related to the three basic behavioural risk management strategies from management science (opportunity control, incentive control, propensity control) (Nooteboom, 2004). Evidence from fields such as occupational safety (Scholz and Gray, 1990), nursing homes (e.g. Braithwaite, 2002), nuclear safety (e.g. Rees, 1994), and the medical professions (e.g. Davies, 2002) indicates that successful strategies avoid the dysfunctional effects of pure deterrence (Brehm and Brehm, 1981) and the negative effects of lenient accommodation by generating value correspondence (Tyler, 1990), thus simultaneously reducing economic temptations and strengthening social bonds.

### *2.3 Mechanisms for the mitigation of moral hazard problems*

Two types of relationships can be distinguished within which one party searches for mechanisms to manage behavioural risks and reduce the probability of rule-breaking on the part of the other party:

- (1) In the buyer-supplier dyad, the supplier's production decisions affect the outcome (i.e. the probability distribution of the product property or attribute) which is relevant to the downstream buyer. While the buyer wants his supplier to comply with contractual rules and standards, he cannot contract contingent on actual action because he cannot directly observe it (information asymmetry). Moreover, he cannot directly observe the outcome (i.e. the credence quality of the product) either.
- (2) In the relationship between authorities and businesses the former aim "to produce business behaviour that adheres to legal standards and rules" (Simpson, 2002). Authorities may be concerned with product-related outcomes of public interest (product safety), or with the free and informed choice of consumers in general. They may also be concerned with outcomes that are not inherent to the product such as environmental impacts, occupational health, or animal welfare.

A complete physical enforcement of contracts and rules is hardly possible as the measures needed to eliminate all opportunities to break them are too costly and/or legally disproportionate. The way out from an institutional economics point of view seems to be to search for complete contingent contracts and rules which are incentive compatible and "get incentives right" (Stiglitz, 1987; Williamson, 1975). Providing incentive compatibility implies to take account of the existence of rule-breaking opportunities and to eliminate all misdirected incentives. If this could be achieved, the "right" economic incentives would supersede any need for social bonds to norms. The incentives for individual actors hinge on parameters such as their degree of risk aversion, the stochastic relationships linking their actions to outcomes, the costs of compliance, and the sanctions in case of detection (including market losses caused by reputational damages). They also depend on the probability of detection and thus on

the effectiveness of the inspection and traceability systems. Even though efforts are regularly made in economic relationships to reduce the other party's opportunities and temptations for rule-breaking, most real-life situations are characterized by contracts and rules that are neither completely enforceable nor fully incentive-compatible. Without norm-based voluntary compliance, misdirected incentives, which cannot be reduced to zero at reasonable costs, continue to induce rule-breaking.

Using a management science perspective with its focus on the performance of applied management practices, Nootboom (1996) operationalises empirical research on contract designs and identifies three relational risk sources: the opportunities for opportunism, the incentives (economic temptations) in force, and the level of benevolence seen as limitations to the propensity to yield to economic temptations. These three sources indicate the three basic strategies for mitigating relational risks:

- (1) opportunity control;
- (2) incentive control; and
- (3) propensity control.

Nootboom and Berger (1997) stress the mixed empirical evidence for the superiority of different behavioral risk management strategies. Klein Woolthuis *et al.* (2005) confirm in a longitudinal study that the relative importance of these three relational risk sources and of the strategy mixtures used to limit them depends on the situational context.

### 3. Integrating the various disciplinary views into one analytical framework

The approaches to the study of behavioural risk described above share the view that deviance is the result of multi-goal and (potentially) opportunistic decision-making of bounded rational individuals. The analytical framework described hereafter is aimed at integrating these approaches.

The analytical framework essentially understands the actors' subjective expected utilities as their motivational drivers. It specifies, in a very general manner, what needs to be studied in a behavioural economic analysis aimed at understanding the mental models and facts as subjectively perceived by the economic actors.

The analytical framework can best be described by the following inequality:

$$E(I_{\text{com}}) - E(I_{\text{non}}) - (RP_{\text{com}} - RP_{\text{non}}) + (EP_{\text{com}} - EP_{\text{non}}) > 0,$$

with:

$$E(I_{\text{com}}) = E(R_{\text{com}}) - E(C_{\text{com}}) - E(S_{\text{com}}),$$

and:

$$E(I_{\text{non}}) = E(R_{\text{non}}) - E(C_{\text{non}}) - E(S_{\text{non}}).$$

$E(I_{\text{com}})$  and  $E(I_{\text{non}})$  denote the expectation value of the income resulting from compliant and non-compliant behaviour, respectively. The expected income is obtained by deducting – for each behavioural alternative – the expected production costs  $E(C)$  and the expected sanction  $E(S)$  from the expected revenues  $E(R)$ . A negative expected income balance ( $E(I_{\text{com}}) - E(I_{\text{non}}) < 0$ ) means that non-compliant behaviour yields a higher expected income than compliance (and vice versa). A negative income balance is

thus equivalent with an economic temptation to break the rules. In addition to the expected income of the behavioural alternatives, their respective risk premiums need to be considered. A negative risk premium balance ( $RP_{\text{com}} - RP_{\text{non}} < 0$ ) implies that the risk associated with non-compliant behaviour exceeds the risk of compliant behaviour (and vice versa). That is, food business operators will add a positive value to their income balance if compliance entails a lower risk.  $EP_{\text{com}}$  and  $EP_{\text{non}}$  denote the immaterial utility gains (ethical premium) for compliant and non-compliant behaviour, respectively. A positive ethical premium balance ( $EP_{\text{com}} - EP_{\text{non}} > 0$ ) indicates that compliant behaviour is morally more acceptable for the food business operator and that it yields a higher ethical premium than non-compliance (and vice versa). If the left-hand side of the inequality sums up to a positive value, the “individual utilities are right”; or to be more precise: if the total is positive, the food business operator has sufficient utility gains from immaterial motivations (including his risk attitude) to protect him from eventually existing economic temptations.

We categorise behavioural determinants (drivers) into the three components “expected income balance”, “risk premium balance”, and “ethical premium balance” (Appendix 1).

For the sake of simplicity, three assumptions have been made:

$$[E(R_{\text{com}}) - E(C_{\text{com}})] - [E(R_{\text{non}}) - E(C_{\text{non}})] < 0,$$

$$E(S_{\text{com}}) = 0; E(S_{\text{non}}) > 0,$$

$$E(P_{\text{com}}) > 0; E(P_{\text{non}}) = 0.$$

The first assumption implies that originally, i.e. before considering sanctions, there are net material rewards for non-compliance (“positive original balance for non-compliance”). The second assumption implies that erroneous sanctioning is excluded (“negative sanction balance for non-compliance”). The third assumption implies that there are net immaterial costs for non-compliance (“negative ethical balance for non-compliance”).

The latter assumption needs to be discussed critically. It corresponds with the logic of control theory (cf. Hirschi, 1969; Tittle, 1995). Since deviant economic acts are mostly located in otherwise legitimate bona fide organisations and carried out by respected members of the professions and the business community, immaterial cost from obeying and immaterial rewards from disobeying are assumed to be zero. This means that effects such as reactance and defiance are not considered and that – contrary to offences such as street gang violence – economic deviance is conceived as being caused by economic temptations that coincide with lacking protective factors rather than by criminogenic factors.

However, in some circumstances  $E(P_{\text{non}})$  may be positive and even higher than  $E(P_{\text{com}})$ . People might feel, for example, that they have to break “senseless rules” to promote “the good in the world”. Others may belong to deviant subcultures or exhibit reactance, which may both give rise to immaterial rewards that favour rule-breaking. It must be noted that we do not know a priori whether these assumptions hold in a given real-life situation. That is, the balance between compliance and non-compliance for the various components may exhibit a different sign in some circumstances.

Relating the framework to the criminological discourse, one could say that immaterial rewards for obeying rules and immaterial costs for disobeying represent the utility-relevant consequences of protective factors. Accordingly, immaterial costs for obeying rules and immaterial rewards for disobeying can be seen as representing the consequences of criminogenic factors. An alternative understanding would be to attach the terms “protective factors” as opposed to “criminogenic factors” to a positive as opposed to a negative balance of the immaterial utilities.

The analytical framework presented in Appendix 1 provides a rough categorisation of behavioural drivers. It details neither the context-dependent subcomponents that determine the utility outcome within each category nor the methods that should be used to analyse them. Referring to food production and abstracting from work effort for the time being, we thence substantiate in Appendix 2 tangible factors that determine the income balance  $E(I_{\text{com}}) - E(I_{\text{non}})$ , and thus – within the material categories of costs  $C$ , revenues  $R$ , and sanctions  $S$  – the utility balance between compliance and non-compliance.

Advantages may be generated by fraudulent labelling. Material benefits from rule-breaking may also result from various kinds of cost savings generated by sub-standard practices regarding environmental, hygienic, occupational safety or animal health prescriptions. The expected sanction, in turn, depends on two crucial parameters:

- (1) the sanction level which an offending actor expects in the case of disclosure; and
- (2) the expected sanctioning probabilities.

The sanction level represents a mixture of economic losses in the case of disclosure, such as direct sanction payments (administrative and penal fines, compensation payments, contractual fines), subsequent expenses (e.g. recall and disposal costs), and opportunity costs (e.g. short- and long-term market losses, loss of subsidies, etc.). The probability of an offence being sanctioned is determined by various factors: to start with, it depends on the conditional probabilities linking actions to outcomes (with higher probabilities for adverse outcomes contingent on non-compliance). It furthermore depends on the intensity of monitoring efforts by downstream controls in the supply chain and by public food inspection as well as the effectiveness of whistle-blower systems. With regard to downstream product controls it should be noted that both incomplete inspection and incomplete tracing increase the relative competitiveness of rule-breaking since they reduce the expectation value of sanctions.

The sanctioning probability in conjunction with other risks determine also the risk premium balance  $RP_{\text{com}} - RP_{\text{non}}$  that is associated with compliance as opposed to non-compliance. A high sanctioning probability will increase the economic risk of non-compliance and increase the negative risk premium balance favouring compliance.

Going beyond material incentives and risk considerations, we specify in Appendix 3 the factors that determine the ethical premium balance  $EP_{\text{com}} - EP_{\text{non}}$ , and thus – within the immaterial categories of intrinsic and extrinsic psychological rewards and costs – the utility balance between compliance and non-compliance.

The immaterial determinants can be divided into the expected opportunity cost of rule-breaking (i.e. the foregone (social-) psychological rewards in the case of rule-breaking), and the direct (social-) psychological costs such as feelings of guilt and social exclusion. They can also be divided, in accordance with their internal or external

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sources, into intrinsic factors (resulting from internalised values) and extrinsic ones (resulting from the probability of social disclosure and the expected reactions of “relevant others”).

Even after rudimentary detailing the context-specific subcomponents of the behavioural determinants, several problems persist. A serious measurement problem will arise if one tries to assess quantitatively the utilities and disutilities associated with economic incentives on the one hand, and the psychological and social costs and rewards on the other. Economic analysts often estimate and quantitatively assess the actors’ material incentive situation using formal models (cf., for example, Starbird, 2005). Hirschauer and Mußhoff (2007) used a moral hazard model in a quantitative, interview-based study of perceived economic incentives in the poultry chain. This model considers all factors that determine the economic temptations for rule-breaking that firms are exposed to in their environments:

- the cost savings and/or sales increases generated by rule-breaking;
- the conditional probabilities of adverse outcomes;
- the detection probabilities from various sources (including downstream product controls and tracing, public food inspection activities including on-site visits, and whistle-blowing); and
- the sanctions.

The latter include administrative fines, compensation payments and other commitments following disclosure such as recalls and disposals as well as the opportunity costs caused by losses of sales from reputational sanctions and the exclusion from business and supply chain networks.

The above-mentioned study has shown that it is difficult but manageable to reconstruct the material utilities as perceived by bounded rational and risk-averse decision-makers. As mentioned above, however, social analysts will regularly encounter an incommensurability problem when trying to quantify the individual’s immaterial utility components or map immaterial gains and losses into monetary units. Hence, qualitative methods of social analysis may be more adequate in obtaining information regarding the social-psychological consequences associated with individual choices including deviance. Furthermore, although the framework understands the subjective expected utilities as behavioural drivers, it is designed as a general tool. Hence, it does not specify context-dependent theoretical propositions regarding the antecedents of the individual’s expectations. That is, it neither describes how these expectations are formed by bounded rational and risk-averse individuals in stochastic environments nor discloses the underlying (biographical and social) cause-and-effect relationships such as an individual’s social learning and conditioning.

#### 4. Conclusions

The proposed analytical framework can be seen as an integrative “language” that facilitates communication between various economic and social analysts who, while using differing foci, methods and perspectives, concern themselves with human misconduct on the basis of methodological individualism. Based on the conception of the framework, the diverse theories of economic misconduct can be understood as variations of the same theme which differ regarding the following dimensions:



- the number and types of behavioural determinants they focus on in the analysis;
- their emphasis on positive explanations as opposed to normative conclusions regarding regulatory strategies;
- their focus on a variation in behavioural determinants between individuals as opposed to a variation between groups and contexts; and
- their perspective in terms of horizontal (static) approaches that assess behavioural outcomes of certain populations at certain points in time, as opposed to vertical (dynamic) approaches that explicitly move up the cause-and-effect chain and search for the social and biographical origins and causes that precede the observed phenomena.

A behavioural economic analysis based on the framework means opening up the black box of the regulatees' action situation by incorporating the subjectively perceived material incentives in addition to reputation effects, social norms and community pressure into the analysis. With regard to agro-food chains, such a behavioural economic analysis would improve our understanding of the interactions between the chain members and various other stakeholders. Using the framework for an institutional analysis of the performance of supply chains regarding the mitigation of behavioural risks implies that situations where existing opportunities and temptations to break rules are not neutralized by protective factors are understood as being the consequence of a less-than-optimal institutional arrangement regarding the solution of the moral hazard problem, i.e. the internalization of external costs.

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## Appendix 1. The framework's categories of behavioural drivers

### *Category 1: Subcomponents determining the expected income balance*

#### *Original material benefits of non-compliance*

Factors determining the expected material sanction:

- Public and non-public sanctions in case of detection.
- Public and non-public detection and sanction probabilities (sanctioning weights).

### *Category 2: Subcomponents determining the risk premium balance*

- Business risks associated with non-compliant behaviour.
- Business risks associated with compliant behaviour.
- The individual's risk attitude.

### *Category 3: Subcomponents determining the ethical premium balance*

- Intrinsic costs of non-compliance (e.g. guilt, deprivation of self-esteem).
- Extrinsic costs of non-compliance (e.g. social exclusion, deprivation of social reputation).

## Appendix 2. Behavioural drivers resulting from the material preferences of food producers

### *Factors determining the expected material benefits from non-compliance*

- Sales increases through mislabelling of products regarding their content (e.g. deer versus kangaroo meat), their weight or their process quality (e.g. organic versus conventional production).
- Cost savings from irregular food production processes such as substandard hygienic practices or breaches of waiting periods (e.g. after application of pesticides or animal drugs).

### *Factors determining the expected material sanction*

Public and non-public sanctions in case of detection:

- Direct sanction payments (e.g. penal/administrative fines, compensation payments, contractual fines).
- Subsequent commitments (e.g. recall and disposal costs for sub-standard goods).
- Opportunity costs (e.g. short- and long-term market losses caused by a deterioration of reputation and exclusion from supply chain networks, subsidy losses from cross compliance).

Public and non-public sanctioning probabilities:

- Probabilistic action-outcome linkages, i.e. conditional probabilities (given compliance or non-compliance) of adverse outcomes.
- Product-orientated control intensities and connected tracing and detection probabilities.
- Detection probabilities from direct activity monitoring and on-site controls in food business operations such as farms, slaughterhouses, retailers.
- Detection probabilities from controls of mandatory record keepings such as drug delivery records, transport documents, selling and buying documents.
- Other detection probabilities (e.g. whistle-blowing by employees, neighbours, etc.).

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### Appendix 3. Behavioural drivers resulting from the immaterial preferences of food producers

#### *Factors determining the immaterial motivation (protective factors)*

(Social-) psychological opportunity costs from non-compliance:

- Intrinsic psychological “opportunity costs”, i.e. loss of intrinsic rewards (e.g. loss of self-esteem of being a “good farmer”, or of not belonging to “those who cheat”).
- Extrinsic psychological “opportunity costs”, i.e. loss of extrinsic rewards (e.g. loss of the usual respect by “relevant others” such as business partners or the village community).
- Probability that the offence becomes known by “relevant others” (social disclosure).

(Social-) psychological costs from non-compliance:

- Direct intrinsic psychological costs (e.g. feelings of guilt and subsequent adverse consequences such as insomnia, etc.).
- Direct extrinsic psychological costs (e.g. explicit ostracism and social exclusion delivered by relevant members of the social communities to which the food business operator is affiliated).
- Probability that the offence becomes known by “relevant others” (social disclosure).

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# Advancing Consumer Protection through Smart Food Safety Regulation

Norbert Hirschauer and Miroslava Bavorová\*

*The reduction of food risks that are caused by malpractice requires a reconstructing understanding of the context-dependent behaviours of food businesses and a corresponding design of adequate governance structures. Concerning ourselves with consumer protection, we focus on the question of which behavioural drivers need to be considered when designing “smart” regulatory regimes that effectively and cost-efficiently foster compliance with food quality and safety rules. Doing so, we link the concept of smart regulation with the concept of risk analysis according to General Food Law<sup>1</sup>. While a systematic comparison of the smartness of concrete consumer protection policies is beyond the paper’s scope, we briefly discuss disclosure policies for two reasons: first, name-and-shame schemes are increasingly used by food authorities in various countries. Second, they seem to be promising candidates for smart consumer protection policies from a regulatory theory point of view as food markets are riddled with information asymmetries.*

## I. Introduction

In its 2010 Communication “Smart Regulation in the European Union”<sup>2</sup>, the Commission explicitly launched a smart regulation agenda and emphasized the continuing need for regulatory improvements. In its subsequent Communication on “EU Regulatory Fitness”<sup>3</sup> the Commission evaluated the progress that had been achieved in the past and outlined in which ways legislation is to achieve its objectives even more effectively and efficiently in the future.

Regulatory improvements are especially important in the policy field of consumer protection. A series of food scandals has indicated that misdirected incentives continue to be a source of food risks and

that there is a lack of transparency in present-day supply chains which, according to the perception of at least some food businesses, make non-compliance more profitable than compliance<sup>4,5</sup>. Lacking market transparency and the opportunistic use of seemingly profitable opportunities to break the rules cause negative externalities and the failure of markets. That is, food producers—be they individual food business operators or large companies—might exploit the fact that neither their production activities nor the resulting food properties can be directly observed by buyers—be they downstream food businesses or consumers. Price spreads for different quality categories and/or the costs of compliance with public and/or private standards may tempt self-

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1 EC Regulation 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

2 European Commission. 2010. Smart Regulation in the European Union. Communication from the Commission to the European Parliament, the Council, the European Economic and Social

Committee and the Committee of the Regions. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0543:EN:NOT> (accessed: 31.05.2013).

3 European Commission. 2012. EU Regulatory fitness. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. [http://ec.europa.eu/governance/better\\_regulation/documents/com\\_2013\\_en.pdf](http://ec.europa.eu/governance/better_regulation/documents/com_2013_en.pdf) (accessed: 31.05.2013).

4 Hennessy, D.A., Roosen, J. and Jensen, H.H. 2003. “Systemic failure in the provision of safe food,” *Food Policy*, 28, 77–96.

5 Casey, D. K., and Lawless, J.S. 2011. “The parable of the poisoned pork: Network governance and the 2008 Irish pork dioxin contamination,” *Regulation & Governance*, 5, 333–349.

interested producers to exploit such information asymmetries.

Criminological theory, with its focus on deviance, informs us that individuals may react differently to economic temptations due to different levels of protective factors (bonds to social norms, community pressure, etc.) that support the rules<sup>6</sup>. Protective factors can be seen as limiting the actors' freedom to break the rules<sup>7,8</sup>, or as forming the non-economic components of the actors' preferences (e.g., ones influenced by notions of fairness and trust). Criminological research on corporate deviance has furthermore shown that individual behaviour within organizations is largely conditioned by the organizational (sub)cultures. These subcultures may deviate from legal standards and generally acknowledged social norms and thus create both material and immaterial incentives for employees to break rules for the company's sake<sup>9,10,11</sup>.

Since applied studies of what makes food producers break (or not break) rules in the economic and social contexts of their supply chains are lacking in many contexts, knowledge gaps persist regarding the design of effective regulatory enforcement strategies. Against this background we do not concern ourselves in this paper with the question of whether present food law is socially efficient in that it raises the wealth of the available social resources. Instead we limit our discussion to the question of which behavioural drivers need to be considered when designing regulatory regimes that effectively and cost-efficiently foster compliance with the (presumably socially efficient) mandatory rules that are in force.

Exploiting the conceptual commonalities of various disciplinary approaches dealing with behavioural/relational risks and deviance, we systematize regulatory structures and regimes and develop an analytical framework. This endeavour is meant to provide an integrative base for an interdisciplinary analysis of the institutional "solutions" that have been found for reducing behavioural risks in supply chains. Doing so, we primarily focus on the role of food safety authorities—and thus consumer policy—because of the preeminent role of governments in achieving consumer protection goals agreed on in the political process. This does not imply that collective action of non-governmental actors and the quest for better institutions beyond governmental regulation are irrelevant.

With this focus on consumer protection, we first distinguish governance from regulation and describe the three most relevant regulatory dimensions (Section 2). In Section 3 we narrow down the term "smart regulation" and link it to General Food Law (EC Regulation 178/2002). While a comparison of the smartness of concrete enforcement measures is beyond the paper's scope, Section 4 is concerned with the question of whether disclosure as a generic class of regulatory measures is eligible for smart regulation. We conclude with Section 5.

## II. Applying Governance and Regulation Concepts to the Food Sector

Avoiding an inevitably piecemeal discussion of historical developments and conceptual differences between social science disciplines concerned with regulation, we aim to provide an integrative conceptual definition. To do so, we first of all distinguish governance from regulation. Following Braithwaite et al.<sup>12</sup> we conceive of regulation as a narrower term than governance. Whereas governance is about providing, distributing and regulating<sup>13</sup>, "regulation can be conceived as that large subset of governance that is about steering the flow of events and behaviour, as opposed to providing and distributing. Of course,

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- 6 Lösel, F. and Bender, D. 2003. Resilience and Protective Factors. In *Prevention of adult antisocial behaviour*, edited by Farrington, D.P. and Coid, J. Cambridge University Press.
  - 7 Tittle, Ch. 1995. *Control balance. Towards a general theory of deviance*. Boulder.
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  - 9 Punch, M. 1996. *Conduct unbecoming*. London.
  - 10 Shover, N. and Scroggins, J. 2009. Organizational crime. In: *The Oxford handbook of crime and public policy*, edited by Tonry, M. Oxford University Press.
  - 11 van de Bunt, H.G. and Huisman, W. 2007. Organizational crime in the Netherlands. In *Crime and justice in the Netherlands*, edited by Tonry, M. and Bijleveld, C. Chicago.
  - 12 Braithwaite, J., Coglianese, C., and Levi-Faur, D. 2007. "Can regulation and governance make a difference?," *Regulation & Governance*, 1, 1–7.
  - 13 This general definition of governance can be related to supply chain management which is about providing/sharing resources and regulating/aligning the activities of different supply chain members in order to reduce chain costs and achieve chain benefits that can be jointly distributed/shared (Arshinder, K., Kanda, A., and Deshmukh, S.G. 2008. "Supply chain coordination: Perspectives, empirical studies and research directions," *International Journal of Production Economics*, 115, 316–335).



when regulators regulate, they often steer the providing and distributing that regulated actors undertake as well<sup>14,15</sup>. While reference could be made to the regulation of any kind of social behaviour, the term “regulation” is more particularly used in relation to economic activity<sup>16</sup> and the correction of market failures. Based on this definition, three crucial regulatory dimensions can be distinguished: (i) the regulator-regulatee relationship, (ii) the regulatee’s behavioural determinants, and (iii) the regulatory regime.

## 1. The Regulator-Regulatee Relationship

While we are focussing on the compliance with food law, it is important to understand that food businesses are subjected to public-private co-regulation which is brought about by a regulatory network of various governmental agencies and non-governmental actors including other businesses in the supply chain, consumers, corporate business associations and special interest groups. Regulatory efforts of public bodies, on the one hand, and private ones, on the other, are sometimes distinguished by using the term “corporate regulation” as opposed to “behavioural management.” The underlying objective is quite identical: the party with the coarser information partition tries to manage/reduce relational risks and steer behaviour.

Within the network structures of the agri-food system<sup>17</sup>, four crucial types of regulator-regulatee relationships can be distinguished: first, the buyer-seller dyads in the food chain (including the pressures exerted by dominant chain actors); second, the relationship between food authorities and food businesses on various chain levels; third, the relationship be-

tween authorities and consumers; fourth, the relationships between citizens/voters and governments. In the network structure, every entity—be it a food business, the food consumer or a food safety authority—is both a regulating actor who aims to steer the behaviour of others, and a regulated actor who is subject to steering efforts by others.

How outside regulators, such as authorities or business partners, can best steer the behaviour of food businesses is often seen to be the core question of regulation in the food industry. With regard to regulator-regulatee relationships, it should be noted, however, that food businesses are often not one-man companies but big corporations with several levels of executives and employees. Albeit on behalf of the organization, both compliant and non-compliant acts are carried out by individuals. In other words, there is also regulation inside companies. As a result, those working within a food company face steering efforts from two regulatory sources: on the one hand, the explicit instructions of company superiors and the implicit behavioural guidelines that are generated by the informal company culture, and, on the other hand, the regulatory efforts of actors outside the company including the activities of law enforcing authorities and the community pressures and reactions of “relevant others” in the individual’s private social context. The eventual engagement of individuals in organizational non-compliance may stem from a blurring of standards within the specific company culture and a tendency to identify with the company’s goals, personal ambition, or fear of negative consequences in case of a refusal to follow illegal instructions. In other words, a successful regulation of a company from the outside requires that the company successfully regulate its employees in line with the standards of the outside regulator.

## 2. The Regulatees’ Behavioural Determinants

The regulatees’ behavioural determinants can be understood as the expected utilities they subjectively associate with their choices. Even though the probability of malpractice can be conceptualized as varying with its economic benefits, there are different individual reactions to economic temptations due to different levels of protective factors that shield actors from rule-breaking. This corresponds to the broad

14 Braithwaite, J., Coglianese, C., and Levi-Faur, D. 2007. “Can regulation and governance make a difference?” *Regulation & Governance*, 1, p. 3.

15 One might add that many regulatory approaches rely on incentives. If so, they necessarily involve the distribution of resources. A rigorous separation of the subset “regulation” from “governance” is hence not viable.

16 Picciotto, S. 2002. Introduction: reconceptualizing regulation in the era of globalisation. In *New directions in regulatory theory*, edited by Picciotto, S. and Campbell, D. Oxford, 1–11.

17 Martinez, M.G., Fearn, A., Caswell, J.A., and Henson, S. 2007. “Co-regulation as a possible model for food safety governance: Opportunities for public-private partnerships,” *Food Policy*, 32, 299–314.

utilitarian view that human behaviour is shaped by a mixture of motivations including social reputation, altruism and other non-wealth maximizing preferences<sup>18</sup> such as professional ethics. Depending on context, utility gains from complying with rules may (or may not) outweigh temptations to break them<sup>19,20,21</sup>.

The analytical framework illustrated in Table 1 is based on this broad utilitarian perspective. It reflects the belief that economic behaviour may be complex but not random or unpredictable<sup>22</sup> and that it can be understood as the result of multi-goal, bounded-rational and (potentially) opportunistic decision-making by individual actors who subjectively form expectations and evaluate outcomes. The proposed framework is based on two key elements of the institutional economics concept by Ostrom<sup>23</sup> which she termed “Institutional Analysis and Development Framework” and which integrates several strands of economic and behavioural theory: first, taking account of the different types of regulator-regulatee relationships, Ostrom emphasizes that there are multiple levels of organized social life and that “what is a whole system at one level is a part of a system at another level.” She also notes that “every social science discipline uses a different language for key terms and focuses on different levels of explanation as the ‘proper’ way to understand behavior”<sup>24</sup>. The analyst who tries to understand rule-governed social life consequently “faces a major challenge in identifying the appropriate level of analysis relevant to addressing a particular puzzle and learning an appropriate language for understanding at least that focal level and one or two levels above and below that focal level”<sup>25</sup>. Second, looking at individual behaviour, Ostrom adds “delta parameters” to the material pay-offs to account for the non-material costs and benefits of breaking and obeying rules.

Table 1 describes the general conception of the framework. It should be noted that the figures are only used to illustrate *which* behavioural determinants promote or discourage compliance. They neither refer to an empirical setting nor are they meant to suggest that one should always try to measure non-material benefits and costs in monetary units. Quite to the contrary! Due to the incommensurability problem that particularly applies to the utility derived from non-material behavioural determinants, their relevance may often be better understood through qualitative studies or econometric analyses. Further-

more, whilst including utilities and disutilities resulting from external social norms and the individual’s internalized value orientations, we do not elaborate on the concept of risk utility and its dependence on the actor’s risk perception and risk preferences. In other words, the extent to which actors dislike the volatility of their goal achievement<sup>26</sup> is considered implicitly. For a risk-averse actor, the indicated temptation of 80, for instance, is already meant to represent the *utility* gain that the actor attributes to non-compliance based on material considerations.<sup>27</sup> For a risk-neutral actor the figures in the table can be understood as monetary values.

For simplicity’s sake we describe the rationale of the framework based on the assumption of a risk-neutral actor: the illustrative actor in Table 1 can save 190 in costs ( $\Delta u_c = -190$ ) by disobeying some rule. Since sales are identical in both cases and since the expectation value of the sanction for disobeying is 110 ( $-u_l^d = \Delta u_l = 110$ ), his expected net material loss caused by obeying amounts to  $\Delta u_a = -80$ ; i.e., he is facing a temptation of 80 to break the rule. If the actor were exclusively maximizing his material bene-

18 North, D.C. 1990. *Institutions, institutional change and economic performance*. Cambridge University Press.

19 Etienne, J. 2011. “Compliance Theory: A Goal Framing Approach,” *Law & Policy*, 33, 305–333.

20 Lehmann Nielsen, V. and Parker, Ch. 2012. “Mixed Motives: Economic, Social, and Normative Motivations in Business Compliance,” *Law & Policy*, 34, 428–462.

21 Pinstrup-Andersen, P. 2005. “Ethics and economic policy for the food system,” *American Journal of Agricultural Economics*, 87, 1097–1112.

22 Garoupa, N. 2003. “Behavioural economic analysis of crime: A critical review,” *European Journal of Law and Economics*, 15, 5–15, p. 6.

23 Ostrom, E. 2005. *Understanding institutional diversity*. Princeton University Press.

24 Ostrom, E. 2005. p. 11.

25 Ostrom, E. 2005. p. 12.

26 Mahul, O. and Pennings, J.M.E. 2004. “Introduction to the special issue on risk behaviour of market participants,” *European Review of Agricultural Economics*, 31, 233–234.

27 It is beyond the scope of this paper to discuss the pitfalls in the empirical elicitation of subjective risk beliefs (risk perceptions) and subjective risk preferences (utility functions). Confer in this regard, e.g., Hudson, D., Coble, K., and Lusk, J. 2005. “Consistency of risk premium measures,” *Agricultural Economics*, 33, 41–49; or Just, R.E. and Pope, R.D. 2003. “Agricultural risk analysis: Adequacy of models, data, and issues,” *American Journal of Agricultural Economics*, 85, 1249–1256. In empirical research, the subjective probabilities provided by economic agents (e.g., in interviews) often contain a risk premium. Hence, a clear distinction between risk beliefs and risk preferences according to the expected utility paradigm becomes difficult.

Table 1: Illustration of the framework for the analysis of behavioural determinants

\* Focal behavioural determinants when classifying regulatory measures into “persuasion” and “punishment.”

	u <sup>o</sup> : Expected utility for obeying		u <sup>d</sup> : Expected utility for disobeying		Δu = u <sup>o</sup> - u <sup>d</sup> : Expected utility balance
<b>Expected utilities from material sources</b>					
c: Costs (various sources)		-200		-10	-190
p: Sales		+1,000		+1,000	0
l: Formal sanctions		-		-110 *	+110
k: Work effort		-100		-100	0
<b>a: Expected total utility from material sources</b>		<b>+700</b>		<b>+ 780</b>	<b>-80</b>
<b>Expected utilities from non-material sources</b>					
i <sup>+</sup> : Intrinsic psychological rewards (e.g., self-esteem)	protective factors	+10 *	criminogenic factors	0	+10
e <sup>+</sup> : Extrinsic social rewards (e.g., social respect)					
i <sup>-</sup> : Intrinsic psychological costs (e.g., guilt)	criminogenic factors	0	protective factors	-60 *	+60
e <sup>-</sup> : Extrinsic social costs (e.g., social exclusion)					
<b>b: Expected total utility from non-material sources</b>		<b>+10</b>		<b>-60</b>	<b>+70</b>
<b>Total utility</b>		<b>+710</b>		<b>+720</b>	<b>-10</b>

fits, the perceived situational incentives of the contract would not be “right”.<sup>28</sup> In the example, however, the actor is assumed to be of a mixed type who has both material and non-material motivations. He is assumed to derive a total of  $u_b^o = 10$  worth of non-material utility for obeying the rules. He is also assumed to experience a total of  $u_b^d = -60$  worth of non-material disutility for disobeying. Given the resulting net worth  $\Delta u_b = 70$  of non-material utility that favours obeying the rule, he is not sufficiently pro-

tected against the temptation to break it, i.e., his total utility balance of  $\Delta u_a + \Delta u_b = -10$  is in favour of rule-breaking.

Relating the framework to the criminological discourse, one could say that non-material rewards for obeying rules and non-material costs for disobeying represent the utility-relevant consequences of “protective” factors that shield economic actors from rule-breaking despite economic temptations. Accordingly, non-material costs for obeying rules and non-material rewards for disobeying can be seen as representing the consequences of “criminogenic” factors<sup>29</sup> that would foster rule-breaking even if economic temptations were absent. Whereas the degree of resistance to a given material temptation results, in principle, from the balance between protective and criminogenic factors, the example in Table 1 reflects the usual characteristics of economic deviance and the rationale of control theory<sup>30,31</sup>. Since deviant economic acts are mostly located in otherwise legitimate bona fide organizations and carried out by respected members of the business and other professional

28 While we do not refer to a negligent actor in Table 1, the inclusion of the category “work effort” facilitates the consideration of actors who are inclined towards negligence due to slothfulness. Such actors would have a negative utility balance and exert diligence only if the costs of not doing so exceeded this balance.

29 An alternative understanding would be to attach the terms “protective,” as opposed to “criminogenic,” to a positive, as opposed to a negative, balance of the non-material utilities as indicated in the last column of Table 1.

30 Hirschi, T. 1969. Causes of delinquency. Berkeley.

31 Tittle, Ch. 1995. Control balance. Towards a general theory of deviance. Boulder.

communities, non-material cost from obeying and non-material rewards from disobeying are assumed to be zero. This means that effects such as reactance<sup>32,33</sup> and defiance are not considered on the business level and that—contrary to offences such as street gang violence—corporate deviance is conceived as being caused by economic temptations that coincide with lacking protective factors rather than by criminogenic factors. However, in some circumstances non-material factors that favour non-compliance may play an important role even on the decision-making level of food businesses. In any case, they are decisive on the decision level of individual employees who work within a company with a deviant company culture and strong group cohesion. Consequently, they will have to be considered in smart regulatory approaches.<sup>34</sup>

While the knowledge of the factors that determine behaviour is crucial for an informative positive analysis of the regulatory status quo and the identification of existing compliance problems<sup>35</sup>, it is, from a normative point of view, equally important to understand the motivational changes that are likely to be brought about by regulatory innovations. Taken separately, one may assume that the more an actor is either extrinsically or intrinsically motivated, the more his inclination to comply will increase<sup>36</sup>. Behavioural economics, however, informs us that the *ceteris paribus* assumption that is implicitly assumed in such a partial perspective is rarely in line with reality. Instead, the following interactions may occur:

- Regulatory innovation increases both the extrinsic and intrinsic motivation to comply. Such a desirable interdependency has been termed “*crowding-in*”<sup>37</sup>.
- Regulatory innovation increases the desirable extrinsic motivation (e.g., through controls and monetary incentives) but impairs the intrinsic motivation. As a consequence, the expected positive effect on behaviour is less pronounced than what would be expected from a partial perspective that looks exclusively at the extrinsic motivation. The balance of the achieved motivational change may even be reduced to zero or become negative. Such dysfunctional effects have been termed “*crowding-out*”<sup>38</sup>.
- Positive intrinsic motivation is not only impaired or reduced to zero, but the regulatees consider the new regulatory measure as an illegitimate inter-

ference with their freedom of action. Such a lack of value correspondence between regulator and regulatees may generate *reactance*. That is, non-compliance may become an intrinsic source of utility, and the regulatees may even accept economic disadvantages to regain their freedom of action by breaking rules that they deem to be illegitimate.

Frey und Jegen<sup>39</sup> describe crowding-out as “one of the most important anomalies in economics, as it suggests the opposite of the most fundamental economic ‘law’, that raising monetary incentives increases supply.” One would certainly have to integrate reactance into this statement. It should be noted that the “anomaly” dissolves if, instead of maintaining a narrow homo economicus assumption, one adopts the broad utilitarian view that human behaviour is shaped by a mixture of motivations<sup>40</sup>. Regulators should consequently consider the interactions between extrinsic and intrinsic motivations and search

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- 32 Brehm, J.W. 1966. A theory of psychological reactance. New York.
  - 33 Miron, A.M. and Brehm, J.W. 2006. “Reactance theory – 40 years later,” *Zeitschrift für Sozialpsychologie*, 37, 9–18.
  - 34 When studying non-compliant behaviour, three levels of analysis can be distinguished (Hess, H. and Scheerer, S. 2004. “Theorie der Kriminalität,” *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, Sonderheft 43, 69–92; Shover and Scroggins 2009; van de Bunt and Huisman 2007): (i) the micro-level of individual decision-making (this includes the decisions made by one-man business operators as well as those made by individuals while at work within an organization), (ii) the meso-level of the organization or company, and (iii) the macro-level of an industry at large. The factors that need to be considered when trying to understand deviance depend on the level of analysis (cf., Ostrom 2005). Adopting the logic of control theory and thus abstracting from criminogenic factors, for instance, may be adequate in a meso-level analysis that considers the company as subject of interest. However, abstracting from non-material behavioural determinants is unlikely to be adequate in a micro-level analysis since economic temptations that arise on the company level may give rise to deviant corporate subcultures with informal social pressures and rewards to bend or break the law.
  - 35 Hirschauer, N. and Zwill, S. 2008. “Understanding and managing behavioural risks – the case of malpractice in poultry production,” *European Journal of Law and Economics*, 26, 27–60.
  - 36 Widdows, R. 2000. “Book Review of Not just for the money: An economic theory of motivation (Frey, B.S. 1997),” *Financial Counseling and Planning*, 11, 77–78, p. 77.
  - 37 Frey, B.S. 1997. *Not just for the money: An economic theory of motivation*. Cheltenham.
  - 38 *Ibid.*
  - 39 Frey, B.S. and Jegen, R. 2001. “Motivation crowding theory: A survey of empirical evidence,” *Journal of Economic Surveys*, 15, 589–611.
  - 40 Pinstrup-Andersen, P. 2005.

for interventions that, at best, generate a crowding-in effect.

### 3. Regulatory Regimes

A regulatory regime is the mixture of regulatory measures that are used to steer the behaviour of economic actors. Depending on the type of the behavioural determinant they are primarily aimed to impact upon, four ideal types of regulatory regimes can be distinguished:

- (1) Hierarchical command and control measures, such as effectively imposed and enforced mandatory rules, impact the set of choices (e.g., through the withdrawal of the operating licence) as well as the incentives (e.g., through sanctioning mechanisms).
- (2) Incentive-oriented mechanisms, such as Pigouvian taxes, government payments, and the creation of novel property rights and markets (e.g., in pollutants), change the relative prices attached to individual actions *without* imposing mandatory rules.
- (3) Measures strengthening bonds with ethical and legal norms, such as the promotion of corporate social responsibility/professional ethics and the “re-integrative shaming” of offenders<sup>41</sup>, are predominantly aimed at changing the actors’ non-

material intrinsic and extrinsic motivations. Through reputation and the market mechanism, socially responsible behaviour may also impact material incentives.

- (4) Human capacity building measures, such as information, counselling and training, are aimed at enhancing the actors’ abilities to comply with rules. Capacity building measures also have an impact on the material incentive situation: the better informed and trained, the smaller the costs and work effort for compliance.

Reducing the regulatees’ physical scope of action rigorously to the set of admissible choices is usually not a viable option for the regulator. This is due to the fact that a complete physical enforcement of rules is hardly possible because the measures needed to eliminate all physical opportunities to break rules are too costly and/or legally disproportionate. The way out seems to be to search for complete contingent contracts (incentive compatible contracts<sup>42</sup>) which get the economic incentives right<sup>43</sup>, with incentives hinging on parameters such as the costs of compliance, the detection probabilities and the sanction levels. Incentive-compatible contracts would account for the existence of rule-breaking opportunities but eliminate all economic temptations to use them. That is, the “right economic incentives” would supersede any need for bonds with social norms.

Despite efforts to reduce both the opportunities and temptations for opportunism, most economic relationships are characterized by incomplete contracts, i.e., the prescribed behaviour is neither completely enforceable nor are the action situations fully incentive-compatible. Without norm-based voluntary compliance, misdirected incentives, which cannot be reduced to zero at reasonable costs, thus continue to induce rule-breaking. Efficient prevention of misconduct therefore requires smart regulatory approaches<sup>44,45,46</sup>. Smart regulation is a holistic regulatory strategy that is aimed to consistently combine measures that reduce misdirected incentives with measures that strengthen the actors’ bonds with social norms and crowd-in intrinsic motivation<sup>47,48,49</sup>. The conception of economic man underlying the change from the famous ‘get incentives right’ to the more adequate ‘get utilities right’ is the key to understanding what the regulatory issue is essentially about<sup>50</sup>.

The systematization of regulatory regimes provided above can be related to the three basic behaviour-

41 Braithwaite, J. 2003. Restorative justice and corporate regulation. In *Restorative justice in context: International practice and directions*, edited by Weitekamp, E. & H.J. Kerner. Devon.

42 We use the term “incentive-compatible contract” in a broad sense to denote an incentive situation resulting from a regulatory regime where the regulatee’s material incentives are right. This does not imply that the regulator is limited to voluntary agreements. Public authorities, for instance, may try to achieve incentive compatibility by using unilateral approaches in the form of mandatory directives with subsequent monitoring and sanctioning.

43 Stiglitz, J.E. 1987. “The Causes and Consequences of the Dependence of Quality on Price,” *Journal of Economic Literature* 25, 1–48.

44 Black, J. 1997. *Rules and Regulators*. Oxford University Press.

45 Braithwaite, J. 2003.

46 Gunningham, N., Grabosky, P., and Sinclair, D. 1999. *Smart regulation: Designing environmental policy*. Oxford University Press.

47 Frey, B.S. 1997.

48 Frey, B.S. and Jegen, R. 2001.

49 Ostrom, E. and Walker, J. (eds.). 2003. *Trust and reciprocity: interdisciplinary lessons from experimental research*. New York.

50 Hirschauer, N., Bavorová, M., and Martino, G. 2012. “An analytical framework for a behavioural analysis of non-compliance in food supply chains,” *British Food Journal*, 114, 1212–1227.

al risk management strategies from management science: (i) opportunity control, (ii) incentive control, and (iii) propensity control<sup>51</sup>. If one associates sanctioning and deterrence not only with punitive measures but with all incentive measures that reduce the relative competitiveness of rule-breaking<sup>52</sup>, it can also be related to the three basic regulatory models from criminology: (i) incapacitation and target hardening, (ii) deterrence, and (iii) accommodation<sup>53</sup>. In institutional economics/principal agent theory the corresponding terms would be (i) reducing the set of rule-breaking actions available to the actor, (ii) reducing the payoffs associated with rule-breaking action, and (ii) increasing the delta parameters that favour rule-compliance.

While changing the order of itemization, a related systematization of steering mechanisms is provided by Braithwaite et al.<sup>54</sup> and Braithwaite<sup>55</sup>. Focusing on mandatory law enforcement, they distinguish “restorative justice coaching” (persuasion/counselling) from “deterrence” (warning letters, civil penalties, criminal penalties) and finally from “incapacitation” (licence suspension, licence revocation). Accounting for the pros and cons of persuasion as opposed to the various forms of punishment, Braithwaite<sup>56,57</sup> advocates a graduated and flexible response (responsive regulation) with escalating/deescalating measures contingent on the regulatee’s degree of bad/good conduct.

According to the enforcement pyramid of responsive regulation (cf. Figure 1)<sup>58</sup>, non-compliance should be met with clear disapproval and increasingly punitive measures in case of non-cooperation. But regulation should always start softly and rely first on persuasion and counselling in order to integrate the offender into the law-abiding community (re-integrative shaming). According to this conception, the harsher the available ultimate sanctions, the more likely compliance will be achieved through persuasion. This has been coined by Ayres and Braithwaite<sup>59</sup> as “speak softly, while carrying very big sticks.”

Relating the responsive regulation model to the framework in Table 1 one could say that, focussing on the enforcement of given mandatory law, responsive regulation is especially concerned with three types of determinants: psychological and social rewards for good conduct, state-administered sanctions, and psychological and social costs (see asterisks in Table 1).

### III. Smart Regulation and the Management of Food Risks induced by Malpractice

Besides the fact that any regulation must be legally viable within a country’s constitutional environment, regulation will only be smart if its design is in line with the theory of market failure. That is, sensible regulatory intervention requires a thorough analysis of externalities and any attempt to correct a market failure should be aimed at eliminating the identified externality as close to its origin as possible. Otherwise, a substantial risk arises that market failure is exchanged for government failure. If markets are failing due to information asymmetries and a lack of transparency, a cost-efficient reduction/elimination of the information asymmetry is the method of choice.

Furthermore, a regulatory design will only succeed to be smart if it is based on a realistic behavioural model in which the relationships between the actors’ behavioural determinants and their behaviour are adequately considered. Instead of focussing on monetary incentives only, this implies getting the utilities right as they are subjectively expected by multiple-goal decision-makers. Getting utilities right requires that the change of extrinsic motivation and the change of intrinsic motivations are simultaneously accounted for. One could also say that a regulatory design can only be smart if the correlations between

51 Nooteboom, B. 1996. “Trust, opportunism and governance – A process and control model,” *Organization Studies*, 17, 985–1010.

52 In contrast to a prevalent association with criminal law, in this paper the term “sanction” is used to denote all economic disadvantages that rule-breakers have to bear in case of detection. This is not limited to penal sanctions and fines, but incorporates also damage compensations, recall and disposal costs for substandard goods, capitalized losses of sales, haggling costs for solving disputes etc. (cf., Williamson, O. E. 1988. “Corporate finance and corporate governance,” *The Journal of Finance*, 3, 567–591).

53 Picciotto, S. and Campbell, D. (eds.). 2002. *New directions in regulatory theory*. Oxford.

54 Braithwaite, J., Healy, J., and Dwan, K. 2005. *The governance of health safety and quality*. Commonwealth of Australia.

55 Braithwaite, J. 2011. “The essence of responsive regulation,” *UBC Law Review*, 44, 445–520.

56 Braithwaite, J. 2001. *Restorative justice and responsive regulation*. Oxford University Press.

57 Braithwaite, J. 2003.

58 Ayres, I. and Braithwaite, J. 1992. *Responsive regulation: Transcending the deregulation debate*. Oxford University Press. p. 40.

59 Braithwaite, J., Healy, J., and Dwan, K. 2005. p. 40.

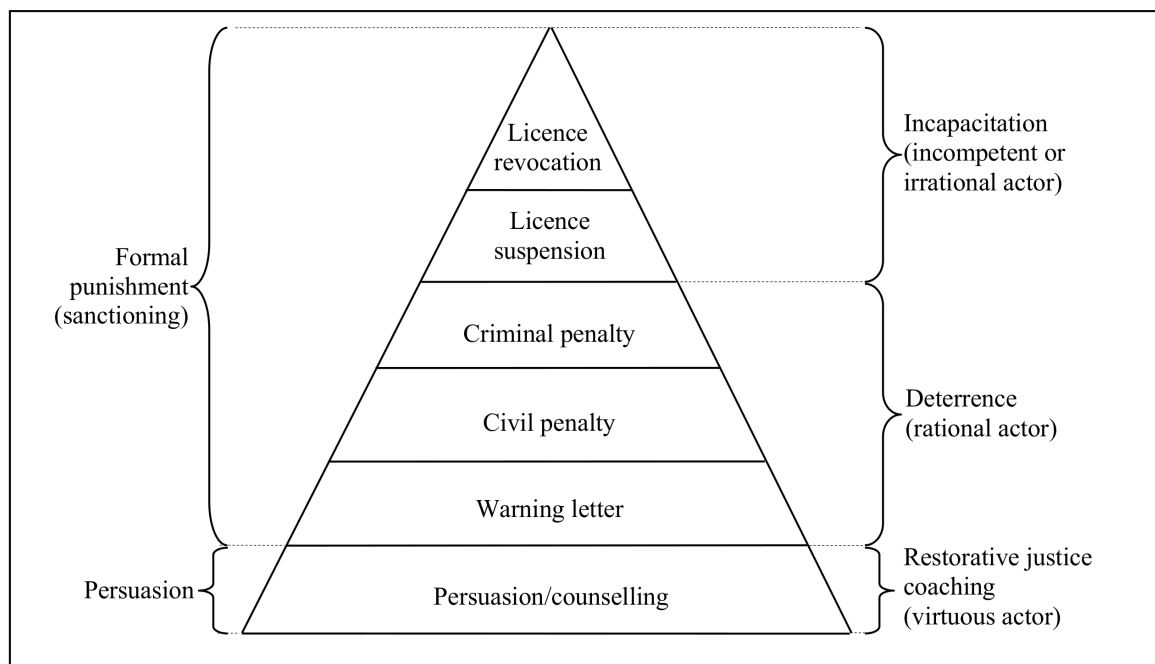


Figure 1: Enforcement pyramid for fostering compliance with mandatory rules (based on Braithwaite, J., Healy, J., and Dwan, K. 2005. p. 40)

the induced change of extrinsic motivation and the induced change of intrinsic motivation are considered adequately.

### 1. Attempting a Definition of Smart Regulatory Innovation

To define smart regulation, one needs to look beyond its prerequisites and consider outcomes. If the regulator has predefined a “desired outcome” (e.g., compliance with food hygiene rules), and if we assume that more compliance dominates less compliance with regard to the regulator’s final benefits, we may attempt an operational definition of “smart regulation” by resorting to a cost-effectiveness analysis that is concerned with behavioural effects. Due to informational constraints, regulators will rarely be able to identify the cost-efficient set of regulatory measures. Instead, they will be limited to conceiving and analysing a limited number of discrete regulatory alternatives that may or may not belong to the cost-efficient set. Smart regulation should thence be understood as a relative concept that focuses on the incremental impact of regulatory innovation and consid-

ers both the regulatory outcome and the regulatory costs.

Instead of using the term “smart regulation” it would thus be more precise to speak of (and aim for) “smart regulatory change.” Figure 2 illustrates this conceptual view: a regulatory change is smart if it dominates the regulatory status quo, i.e., if it produces more compliant behaviour at identical or lower regulatory costs, or if it produces an identical amount of compliance at lower costs. The set of regulatory innovations that come into consideration may be limited by two additional factors: first, the regulator may have defined a compliance threshold (minimum effectiveness constraint) that reduces the choice set that comes into question. Second, the regulator’s choices may be further constrained by a predefined budget that may be smaller than in the status quo. For the sake of completeness, one should add that some regulatory alternatives may increase the level of compliance but incur higher regulatory costs. The relative competitiveness of such non-dominant changes (their smartness) can only be evaluated after the outcome (e.g., the reduction of hospitalizations due to food poisoning) has been approximately mapped into monetary units.

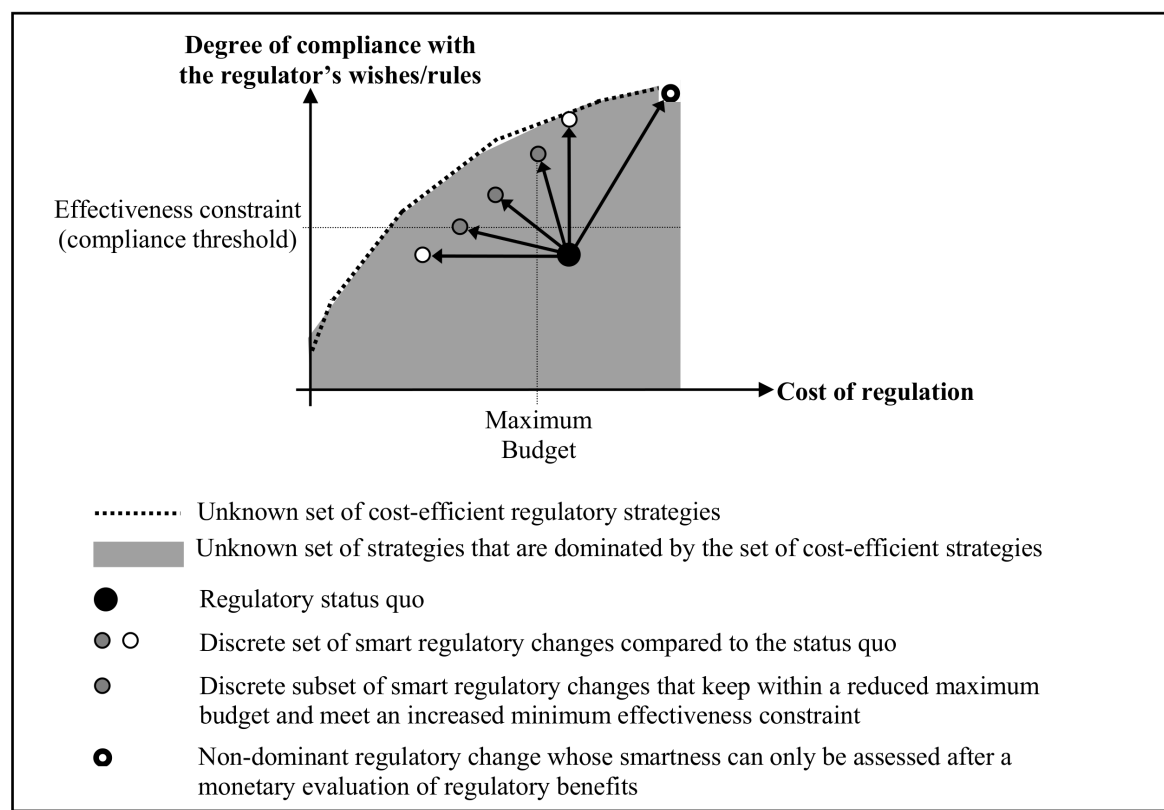


Figure 2: Smart regulatory change

## 2. Linking Smart Regulation and Behavioural Risk Analysis to EU General Food Law

The prevention of malpractice and the reduction of behavioural food risks is an important field of action for public authorities that act on behalf of consumers. Against this background, the concept of smart regulatory change can be linked to the EU's General Food Law according to which "risk analysis is a process consisting of three interconnected components: risk assessment, risk management, and risk communication"<sup>60</sup>. It can also be linked to the law's requirement to adequately consider emerging risks.

While conventional food risk analysis based on EC Regulation 178/2002 focuses on technological hazards and effective crisis management (after-the-fact preparedness), moral hazards in the form of non-complying food businesses need to be considered as additional and independent sources of food risk that have to be systematically included in risk analysis. Connecting the concept of smart regulation with food

risk analysis according to the General Food Law calls for a moral hazard and behavioural risk analysis, i.e., the early identification of food risks that might (re-)emerge due to the breaking of rules that were designed to prevent them in the first place. In other words, risk analysis needs to attack all sources of risk, including behavioural ones. In this process it needs to be aimed at getting in possession of relevant information as soon as possible to provide time to react and to prevent problems before they become problems. Extending the principles of food risk analysis to behavioural risks, interested parties first need to *assess* behavioural risks in order to identify those activities where non-compliance with rules may seem a viable proposition for food business operators. They then need to *manage* behavioural risks through adequate preventive measures (proactive approach). Both activities need to be supported by adequate risk *communication* involving all stakehold-

<sup>60</sup> EC Regulation 178/2002.



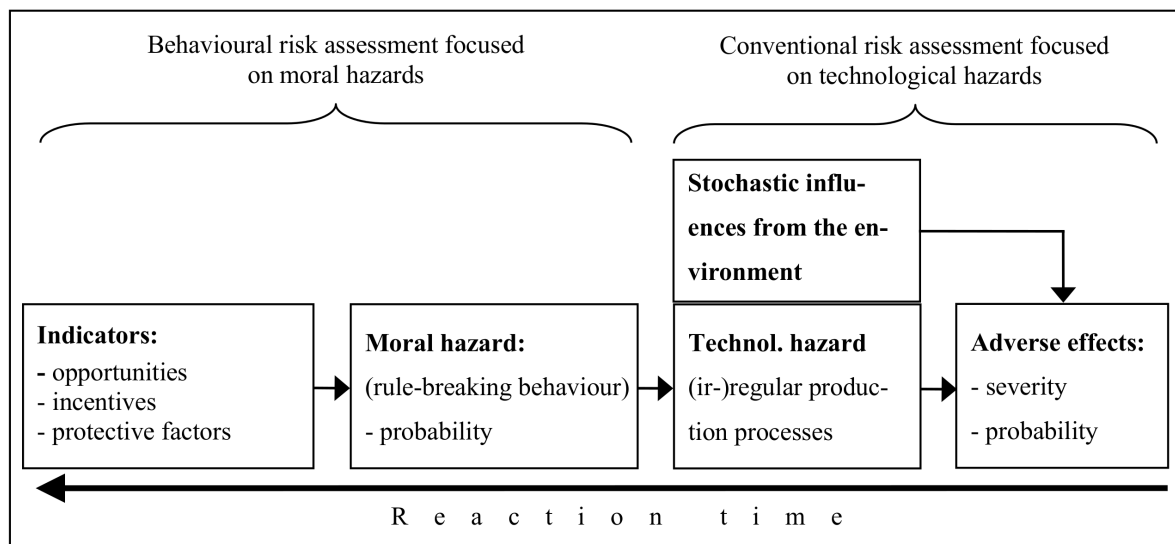


Figure 3: Integrated smart regulatory concept of an early identification of risks that may re-emerge due to producers' malpractice

ers. Figure 3 outlines the integrated smart regulatory concept of an early identification of risks that may re-emerge due to producers' malpractice.

The development of a proactive behavioural risk management system could eventually benefit from an analogy with the HACCP philosophy<sup>61</sup>. The widely established HACCP-approach lays down seven general principles that are to be followed and adapted to the specific context. HACCP can be seen as a generic *proactive technological risk management system* that, so far, is limited to the prevention of unintentional technological and human failures. A *proactive behavioural risk management system* could be based on the same general principles and be correspondingly termed "moral hazard analysis and critical control points system" (M-HACCP). This would imply that food authorities adopt a self-conception as behavioural risk managers who try systematically to reduce behavioural risks by defining critical control points and adequate monitoring procedures with regard to risks that may result from malpractice of food business operators.

Using the analogy with the HACCP approach gives rise to several interesting questions: first, could en-

forced co-regulation be a viable solution for moral hazard problems? In other words, would it make sense to oblige food businesses to adopt such a M-HACCP system of some sort in order to mitigate the externality problem, which arises if they themselves are not motivated to reduce downstream dis-economies and manage moral hazard on the part of their suppliers? Second, it would be interesting to investigate whether, and eventually under which circumstances, the introduction of a behavioural risk management system in food businesses could be achieved through private contracts initiated by downstream businesses in the food chain. In this context, a third question arises: should the design of such a system be entirely left to food business operators or should its introduction be combined with an external specification of well-defined standards (e.g., concerning adequate control points) that are justified by a publicly desirable level of behavioural risk reduction.

#### IV. Assessing the Eligibility of Disclosure as a Smart Regulatory Approach

The introduction of a new regulatory approach in consumer policy represents a deliberate change of the actors' institutional environment. The outcomes of such a change are not certain at the outset. Before new consumer policies are implemented, it is there-

61 Mortimore, S. and Wallace, C. 2013. HACCP. A practical approach. 3rd ed. Heidelberg et al.

fore essential to assess the behavioural changes that are likely to be caused by the intended institutional change. Regulatory impact assessment is oftentimes associated with the provision of decision-support for regulators who have the choice among a set of concrete regulatory alternatives. It should be pointed out, however, that such a short-list of alternatives must be a priori specified and selected from a group of promising candidates.

While a systematic comparison of the smartness of concrete consumer protection policies is beyond the scope of this paper, we briefly discuss whether the generic class of disclosure policies has the potential to provide promising candidates for adequate behavioural risk management strategies and thus smart regulation. We focus on disclosure because food safety authorities increasingly use disclosure schemes of various designs to advance the consumer protection goal. Furthermore, well-designed disclosure schemes seem indeed to be promising candidates for smart consumer policies because, in the consumer food market which is riddled with information asymmetries, they attack the underlying problem directly.

Buyers and especially consumers of food products prefer to buy from compliant food businesses. Publishing information on a company's compliance behaviour increases transparency, strengthens the sovereignty of consumers and better enables them to make free and informed choices<sup>62,63</sup>. If this information is successfully conveyed to consumers via effective disclosure policies, non-compliant businesses will face a competitive disadvantage. They will be sanctioned not only by the state but also by a loss of market share. Besides economic losses, a loss of reputation may also provoke social sanctioning from "relevant others" such as business associates, regular customers, neighbours, friends, and relatives. The anticipation that both economic and social sanctions may arise from rule-breaking furthers the motivation to comply. Disclosure policies can thus be understood as regulatory devices that are aimed at increasing the total amount of compliance by consistently complementing state-administered sanctions with market-based sanctions and social sanctions. In the course of time, the social context and pressure may even induce the economic actors to internalize the corresponding norms.

Against this background, food authorities in many countries have adopted transparency schemes in the form of "name-and-shame" to advance the regulato-

ry goal. Name-and-shame measures are co-regulatory public-private regimes that combine *public* inspection with *private* sanctioning via transparent markets. The schemes that have been put in practice in various countries differ in many variables. While it is known that the precise institutional design of transparency regimes determines whether and to what extent they are smart, there are few comparative studies in this regard in the food sector.

In Denmark, a government-mandated disclosure scheme was introduced in 2001<sup>64</sup>. In the Danish system food businesses are classified via grades from 1 (full compliance) to 5 (serious compliance deficits), each of which is symbolized by an easily comprehensible pictogram (smiley). The full inspection results as well as the smileys must be published in the premises of restaurants and food shops. Highlighting its essential characteristic, this information policy has been widely coined "scores-on-doors." Scores-on-doors approaches are convenient for consumers because they reduce their information search costs.

In Germany a few pilot disclosure projects following a scores-on-doors approach have been carried out<sup>65</sup>. While the introduction of a smiley system is under discussion at present, the country's federal system may represent an insurmountable impediment to a nationwide solution. In contrast to the mandatory Danish disclosure system, publication of inspection results in the pilot projects—with the exception of the smiley system in Berlin Pankow—has been voluntary. As a result, they have the overall character of award schemes rather than the character of name-and-shame.

In the UK, since 2005 an increasing number of local food authorities began to introduce various voluntary schemes to publish the results of food inspection. In the meanwhile, a uniform system has been

62 Fung, A., Graham, M., Weil, D., and Fagotto, E. 2007. Transparency policies: Two possible futures. Taubman Center Policy Briefs 1–6. Harvard University. [http://www.hks.harvard.edu/var/ezp\\_site/storage/fckeditor/file/pdfs/centers-programs/centers/taubman/transparency\\_new.pdf](http://www.hks.harvard.edu/var/ezp_site/storage/fckeditor/file/pdfs/centers-programs/centers/taubman/transparency_new.pdf) (accessed: 26.07.2013).

63 Schoenheit, I. 2004. Die volkswirtschaftliche Bedeutung der Verbraucher Information. Landeszentrale für politische Bildung: Politikfeld Verbraucherschutz. Potsdam.

64 DVFA (Danish Veterinary and Food Administration). 2011. Smileys keep food safety high in Denmark. <http://www.findsmiley.dk/en-US/Forside.htm> (accessed: 01.07.2013).

65 Bavorová, M. and Hirschauer, N. 2012. "Producing compliant business behaviour: disclosure of food inspection results in Denmark and Germany," *Journal of Consumer Protection and Food Safety*, 7, 45–53.

developed and programmatically labelled “scores-on-doors”. By the year 2013 it had been adopted by nearly all local food safety authorities. Scores on doors ratings are based on a malus point system and six ratings are distinguished, ranging from 0 (hygiene standards are very poor) to 5 (hygiene standards are very good). While the form of the presentation is uniform throughout the UK, it is, as yet, a voluntary scheme in some regions (England and Northern Ireland) and an obligatory scheme in others (Wales).

Since July 2010, the New York City Health Department requires restaurants to post “grade cards” visibly in the business premises<sup>66</sup>. These cards show the malus points that the restaurants have received in the public sanitary inspection. Grade A corresponds to a score between 0 and 13, grade B to a score between 14 and 27. Grade C is assigned for more than 28 malus points. Food inspectors check for compliance in the fields of food handling, food temperature, personal hygiene and vermin control. Each violation of a regulation earns a certain number of malus points. Grading is then based on totalled malus points.

The co-regulatory name-and-shame approach has proven to effectively increase compliance in a number of cases<sup>67,68,69,70,71</sup>. Complementing the steering tools as shown in the regulatory pyramid (cf., Figure 2), this can be attributed to the following reasons:

- (1) No erosion of the state’s deterrence and incapacitation capacity occurs since public monitoring and the formal sanctioning of offences by the law remain untouched.
- (2) Formal (public) sanctioning is consistently supported by market-based (private) sanctioning. Impending sales losses are often a more powerful economic deterrent than public sanctions.

- (3) Economic sanctions are intrinsically linked with social sanctions since food business operators suffer a loss of social reputation and even ostracism following disclosure.
- (4) Market-based sanctioning is likely to avoid the dysfunctional effects of crowding-out and reactance that are often associated with tightening public controls and sanctions. They are even likely to crowd in intrinsic motivation because food business operators, accustomed to seeing themselves as entrepreneurs in a competitive market environment, accept customer demands regularly as legitimate. They often consider state-administered sanctions, however, as an illegitimate interference with their entrepreneurial freedom.

Comparing the relative competitiveness of different regulatory approaches requires that not only their effectiveness, but also their costs, are considered. While it is difficult to obtain data on the costs of the various activities of food safety authorities, it may be assumed that the costs of transparency schemes are relatively low: first, the relevant costs comprise only the incremental costs of implementing the scheme, whereas the bulk of regular inspection costs are caused independent of whether a transparency scheme is established or not. Second, no additional sanctioning costs arise from transparency schemes because, from the food authority’s point of view, the task of sanctioning is “outsourced” to the consumer. We thence expect that the introduction of name-and-shame will prove to be a smart regulatory change<sup>72</sup>. It must be noted, however, that its practicability also depends on its viability within a nation’s legal and constitutional environment and, last but not least, on the quality and reliability of public food inspection and the corresponding trust in the integrity of governmental institutions.

## V. Conclusions

Our paper has been motivated both by the discussion on smart regulation within the EU and the exigencies of contemporary food risk analysis and consumer protection. We address the question of how to design smart regulatory tools in terms of better food law enforcement strategies. Smart food law enforcement strategies need to understand rule-breaking as moral hazards and consequently adopt a be-

66 New York City Department of Health and Mental Hygiene. 2012. Restaurant inspection information. <http://www.nyc.gov/html/doh/html/services/restaurant-inspection.shtml> (accessed: 22.07.2013).

67 Fung, A., Graham, M., Weil, D., and Fagotto, E. 2007.

68 Jin, G.Z., and P. Leslie, P. 2003. “The effect of information on product quality: Evidence from restaurant hygiene grade cards,” *Quarterly Journal of Economics*, 118, 409–451.

69 Jin, G.Z. and Leslie, P. 2009. “Reputational incentives for restaurant hygiene,” *American Economic Journal: Microeconomics*, 1, 237–265.

70 Nielsen, K.A. 2007. “The Danish smiley scheme secures transparent food control – and raises food safety,” *European Food and Feed Law Review*, 5, 307–311.

71 Spear, S. 2006. “Could scores on doors just be a wish upon a star?,” *Environmental Health Practitioner*, 114, p. 3.

72 Bavorová M., and Hirschauer, N. 2012.

havioural risk analysis and management perspective that goes beyond the limited surveillance and rapid response perspective of conventional food risk analysis. We argue that the analysis and management of behavioural food risks need to be integrated in a systematic food risk analysis according to the EU's General Food Law and that it could be organized in analogy to the HACCP philosophy. We also argue that a change in the enforcement of food regulations is only smart if, compared to the status quo, it prevents rule-breaking more cost-efficiently and if it guarantees predefined minimum compliance standards. This, in turn, requires a realistic behavioural model in which all relevant behavioural determinants and their interdependencies are adequately considered.

The behavioural risk management perspective based on an adequate model of behaviour provides an integrative language both for an interdisciplinary analysis of existing regulatory practices and an interdisciplinary search for better institutional solutions. From a behavioural management point of view, the disclosure of food inspection results (name-and-shame) combines many properties that are prerequisites for cost-efficient regulation. In addition, there is empirical evidence indicating that name-and-shame fosters compliance. However, its cost-efficiency is determined by its precise institutional design. Hence, more research is needed to shed light on how various design variables, such as the location and visual representation of inspection results, finally impact the prevention effects.

# Food safety and network governance structure of the agri-food system

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## 1 The problem background of food quality and safety

Over the last decades, citizens, consumers and policy makers have become increasingly concerned about the challenges related to the agri-food system such as food security, food quality and safety, the free and informed choice of consumers, animal welfare, environmental protection and the mitigation of climate change. Troubled by the negative externalities of food production, as well as the occurrence of a great number of incidents including food law offences and fraudulent behaviour, consumers and policy makers call for more efforts to identify the failures in food markets and mitigate the corresponding credence quality problems and food risks. Hazards and food quality threats may arise at all levels of the food supply system, and safety precautions and controls may fail due to technological flaws and human errors or misbehaviours on any of these levels.

Since food quality and safety depend on all members of the food supply chain, improving the chain's quality and safety performance requires *collective action* and the design of *governance structures* which facilitate organizational choices that overcome the information and coordination problems within the supply chain. In relation to the self-organization of food businesses, the general governance perspective can be related to private contracts and supply chain management. Supply chain management is about providing/sharing resources and aligning the activities of different supply chain members in order to reduce chain costs and increase chain benefits that can be distributed among the chain members (cf., Arshinder and Deshmukh 2008). In other words: technological and behavioural uncertainties may induce food businesses to make voluntary multi-lateral agreements and allocate

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resources to systems that channel information along the chain and favour the coordination among chain members (cf., Hammoudi et al. 2009; Hobbs 2004; Martino and Perugini 2006; Ménard and Valceschini 2005; Unnevehr and Jenson 1999).

The last decades have also seen the change from a local and/or national level to a global level food supply system. The main drivers of this change are the removal of trade barriers, technological innovation, economies of scale, and steadily increasing demands on food quality, diversity and year-round availability. At present, food production and distribution is governed by a multi-level network of various governmental and non-governmental actors, including food authorities, market participants, business associations and special interest groups, i.e., a system of public and private institutions that support and regulate economic activities and transactions. Following Braithwaite et al. (2007), we conceive *regulation* as a narrower term than governance. Whereas governance is about providing, distributing and regulating, “regulation can be conceived as that large subset of governance that is about steering the flow of events and behaviour, as opposed to providing and distributing. Of course, when regulators regulate, they often steer the providing and distributing that regulated actors undertake” (Braithwaite et al. 2007: 3).

Besides international food safety and trade agreements, four major types of *regulator–regulatee relationships* can be distinguished within the network structure of the agri-food system: first, the various buyer–seller dyads along the food chain (including the relationship between dominant chain actors and other chain members), second, the relationship between food authorities and food businesses on various chain levels, third, the relationship between food authorities and consumers, and fourth, the relationship between food consumers/citizens and governments. In the network structure of the agri-food system, every entity—be it a food safety authority, a food business or the food consumer—is both a regulating actor who aims to steer the behaviour of others, and a regulated actor whose behaviour is subject to steering efforts by other stakeholders.

Due to the pre-eminent role of food businesses for food quality and safety, mitigating market failures and corresponding food risks requires effective and cost-efficient regulations that reduce information asymmetries and make businesses internalize externalities. In this context, we need to abandon a perspective that focuses exclusively on the regulation of food businesses by governments. Instead, we need to understand that the food businesses in the supply chain are subjected to *co-regulation*, i.e., a mix of public and private regulatory measures. The steering efforts of public bodies (sometimes termed: “corporate regulation”) are predominantly associated with *law-making* and legal sanctions, whereas the steering efforts of private actors (sometimes termed: “relationship management”) are usually linked to *private contracts* and liabilities. The underlying objective is, however, identical: the party with the coarser information partition tries to manage behavioural risks and steer behaviour.

## 2 Behavioural determinants and regulatory regimes

The regulatory mechanisms that are used to steer behaviour have impacts on one or several of the following *behavioural determinants*: first, the set of choices that is

available to the actors, second, the material incentives they are exposed to, third, the social and psychological rewards and costs resulting from their choices (e.g., social respect, ostracism, self-esteem, guilt), and fourth, their individual abilities and capacities.

Depending on the type of the behavioural determinant they are primarily intended to impact, four ideal types of *regulatory regimes* can be distinguished:

1. Hierarchical command and control measures, such as effectively imposed and enforced mandatory rules, impact on the set of choices (e.g., through the withdrawal of the operating licence), as well as on the material incentives (e.g., through legal sanctions).
2. Incentive-oriented mechanisms, such as price rises and cuts, Pigouvian taxes, government payments, liabilities, and the creation of novel property rights and markets, change the relative prices attached to individual actions without resorting to command and control in terms of behavioural prescriptions.
3. Measures strengthening bonds to social norms, such as the promotion of corporate social responsibility through persuasion and “re-integrative shaming” (cf., Braithwaite 2003), are aimed at changing the actors’ social and psychological rewards and costs, i.e., their non-material extrinsic and intrinsic motivation. Through market reputation and consumer response, socially responsible behaviour may also impact the actors’ material incentives.
4. Human capacity building measures, such as the provision of information, counselling and training, are aimed at enhancing the actors’ abilities to adopt the desired behavioural change and act according to the regulator’s wishes. Capacity building measures have also an impact on material incentives: the better informed and trained, the smaller the costs of adoption.

With its focus on law-enforcement and public regulation, criminology provides an alternative way of classifying regulatory regimes. In the words of Murphy (2008: 113), one can state that there is a division “between those who think that individuals and firms will comply with rules and regulations only when confronted with harsh sanctions and penalties, and those who believe that gentle persuasion and cooperation works in securing compliance.” In addition to physical incapacitation and target hardening, this antithetic pairing has been labelled the deterrence versus accommodative model of regulation (cf., Picciotto and Campbell 2002).

While incentives are not always the primary focus, most regulatory regimes have an impact on the actors’ incentive situation via some sort of sanctioning mechanism. According to Williamson (1985), incentives are influenced by “legal ordering” (legal sanctions for law-breakers) and “private ordering” (e.g., pledges and guarantees that are used for the ex post sanctioning of rule-breaking/opportunistic behaviour). More precisely, we can distinguish formal sanctions based on administrative law (e.g., administrative fines), criminal law (e.g., criminal penalties), civil code/tort law (e.g., damages) and private contracts (e.g., contractual fines) from informal sanctions. In transparent markets, informal sanctions arise in the form of opportunity costs that are caused by the negative reactions of market partners after the disclosure of opportunistic behaviour (e.g., reduced sales caused by a loss of reputation).

There is no exclusive relationship which links certain types of regulators (e.g., public or private) to particular types of regulatory regimes (e.g., command and control vs. incentives). Food authorities regulate through mandatory law, as well as via incentives, bonds to norms and human capacity building. Public disclosure systems such as name-and-shame (cf., Bavorová and Hirschauer 2012), for instance, are co-regulatory mechanisms that explicitly combine public food law, food inspection and legal sanctions with an appeal to professional ethics, social pressure and a decisive change of material incentives brought about by the reputational sanctioning of private actors (e.g., a negative market response by consumers after disclosure of misconduct). A mix of regulatory mechanisms is also used by private firms. While they are mostly seen as relying on hierarchical command and control mechanisms within the firm, and on market incentives for inter-firm transactions, regulatory mixtures are used in both situations: within firms, incentive-based payment schemes complement command and control in many cases, and in the presence of product quality uncertainty inter-firm transactions are often characterized by tight contractual arrangements that are close to command and control approaches. In brief, we may state that all food businesses are co-regulated by a mixed group of public and private regulators, all of which rely on a mixture of regulatory mechanisms. Real-life food production contexts differ both in the intensity of regulation and the relative importance that can be attributed to diverse regulators and regulatory mechanisms. Using the term “contract” in a wide sense as “defining the rules of the game” (be it through voluntary agreements or through the unilateral directives of a dominant regulator), one could also understand and analyze regulation and organization as contractual choice issues (cf., Williamson 1985).

While the knowledge of the factors that determine the behaviour of food businesses is crucial for our understanding of the regulatory status quo and the identification of existing food quality and safety problems (cf., Hirschauer and Zwoll 2008), it is equally important to understand the dynamic shifts of extrinsic and intrinsic motivation brought about by *regulatory change* (regulatory innovation). Taken separately, one might assume that the more a regulatory measure generates material incentives to comply with the regulator’s wishes, the more the regulatee’s inclination to do so will increase (cf., Widdows 2000). Behavioural economics, however, inform us that the *ceteris paribus* assumption implicitly made in such a perspective is rarely in line with reality. Instead, the following interactions between extrinsic and intrinsic motivations may occur:

- Regulatory change may succeed in simultaneously increasing the actor’s extrinsic and intrinsic motivation to act in accordance with the regulator’s wishes or rules. Such a desirable interdependency has been termed “*crowding-in*” (cf., e.g., Frey 1997).
- Regulatory change, such as new controls, monetary rewards or sanctions, may change the relative competitiveness of individual action and increase the extrinsic motivation to comply, but intrinsic motivation may be impaired. As a consequence, the positive effect on behaviour may be less pronounced than what would be expected from a partial perspective that focuses exclusively on the extrinsic motivation. The balance of the desired change in behaviour may even



be reduced to zero or become negative. Such dysfunctional effects have been termed “*crowding-out*” (cf., e.g., Frey 1997).

- Positive intrinsic motivation may eventually not only be impaired or reduced to zero, but regulatees may consider new regulations (e.g., costly new standards) as an illegitimate interference with their freedom of action. Such a lack of value correspondence (cf., Tyler 2006) between regulator and regulatees may produce defiance and *reactance* (cf., Miron and Brehm 2006) that give rise to a genuine intrinsic motivation not to comply. If so, regulatees may even accept economic disadvantages to regain their freedom of action by breaking the rules that they consider illegitimate.

Frey and Jegen (2001: 590) describe crowding-out as “one of the most important anomalies in economics, as it suggests the opposite of the most fundamental economic ‘law’, that raising monetary incentives increases supply.” One would certainly have to integrate reactance into this statement. It should be noted, however, that the “anomaly” dissolves if, instead of maintaining a narrow rational choice assumption of wealth maximization, one adopts the broad utilitarian view that people pursue multiple goals and that human behaviour is shaped by a mixture of motivations (cf., Pinstrup-Andersen 2005).

### 3 Smart regulation and regulatory impact analysis

In its 2010 Communication on “Smart Regulation in the EU” (European Commission 2010), the European Commission launched an explicit *smart regulation* agenda and emphasized the continuing need for regulatory improvements. In its subsequent Communication on “EU Regulatory Fitness” (European Commission 2012), the Commission evaluated the progress that had been achieved in the past and outlined how regulation is to achieve its objectives even more effectively and efficiently in the future. From the viewpoint of a public regulator, such as national governments or the EU, smart regulation must be in line with the theory of market failure; i.e., the design of sensible regulatory intervention requires a thorough analysis of externalities and any intervention should be aimed at eliminating the identified externality as close to its origin as possible. Otherwise, a substantial risk arises that market failures are exchanged for government failures. If markets are failing due to information asymmetries and a lack of transparency, for instance, the reduction/elimination of that information asymmetry should be the regulatory objective.

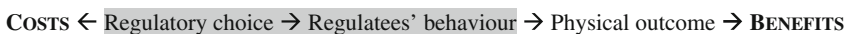
The regulation of food businesses will only be smart if it meets two conditions: first, regulatory strategies can only be applied successfully if they are viable within a nation’s legal and constitutional environment. Second, smart regulation has to be effective in that it changes the behaviour of food businesses in a significant way and in the direction intended by the regulator. From the perspective of a food authority, effective strategies are those that produce compliant behaviour, thus improving food quality and safety and guaranteeing the free and informed choice of consumers. To be effective, regulation must be based on a realistic behavioural model in which the

relationships between the actors' behavioural determinants and their behaviours are adequately considered. Instead of focusing exclusively on material incentives, this requires a holistic approach which is aware of crowding-out and reactance problems and consistently combines measures that reduce misdirected incentives with measures that strengthen the actors' bonds to social norms (cf., Frey and Jegen 2001; Ostrom and Walker 2003). Any attempt to make an isolated impact on material incentives runs the risk of backfiring. Adopting a broad utilitarian view according to which human behaviour depends on multiple motivations, such a holistic approach can be understood as a strategy which aims to get the utilities right that are subjectively expected by multiple-goal and eventually bounded-rational actors. The conception of economic man underlying the change from the famous "get incentives right" to the more adequate "get utilities right" is the key to understanding what the regulatory issue is essentially about (Hirschauer et al. 2012).

The obvious and comprehensible focus of the Commission's smart regulation agenda is public regulation and, more specifically, EU legislation. However, each regulator—be it a public or a private one, and be it in the food industry or another sector of the economy—should be interested in the output (i.e., the change in behaviour) and the outcome (e.g., the change of food quality and safety) that a regulatory innovation is likely to induce. In other words, the design of a regulatory system which is consistent with the regulator's objectives requires a reliable *regulatory impact analysis*.

In a fully comprehensive regulatory impact analysis, the whole set of functional relations as depicted in Fig. 1 would need to be analyzed along the entire food chain. In other words, a full-scale cost-benefit analysis would be necessary, based on a thorough estimation of the costs of different regulatory systems, as well as a monetary evaluation of regulatory benefits (cf. e.g. Gunningham et al. 1999; Kirkpatrick and Parker 2007).

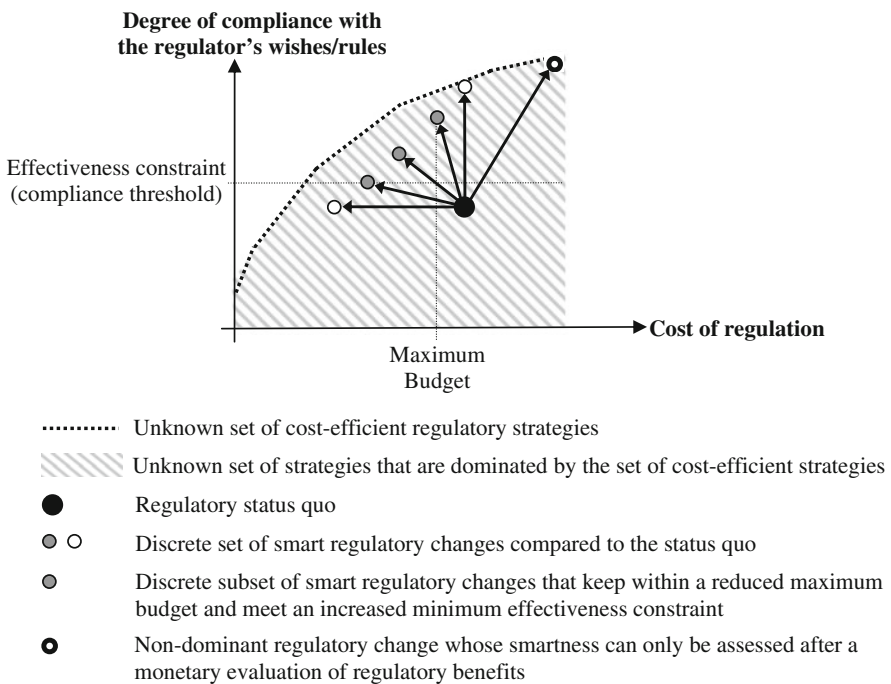
To reduce complexity, regulatory analysts often discard full-scale cost-benefit analyses and settle for partial analyses. That is, they confine themselves to studying selected subsets of the functional relationships depicted in Fig. 1. Willingness-to-pay analyses, for instance, are limited to the monetary evaluation of given physical outcomes. Transaction cost analyses focus on the cost side of regulatory systems and organizational arrangements. Regulatory cost-effectiveness analyses, in contrast, compare the costs of regulatory change either with the incurred change in behaviour or the physical outcome, both of which are measured with a non-monetary yardstick. While doing without a monetary evaluation of regulatory benefits, the methodological requirements of cost-effectiveness analyses remain challenging, especially if they are so extensive as to measure the achievement of physical objectives. Besides the assessment of regulatory costs, two complex functional relationships need to be clarified in such an extensive analysis: first, one



**Fig. 1** Functional relationships in a comprehensive regulatory impact analysis

needs to answer the question of which behaviours are likely to be caused by the interventions under investigation (e.g., incentive payments for a reduction of nitrogen use in crop farming vs. mandatory standards). Second, one needs to study how these behaviours impact the regulator’s physical objective (e.g., the intended nitrogen reduction in drinking water).

It cannot be emphasized enough that the understanding of the relationship between regulatory measures and the actors’ behaviour is a sine qua non for providing meaningful decision support for the regulator. In other words, the core question of any regulatory impact analysis is what behavioural changes are likely to result from which regulatory measures. If the regulator has predefined a “desired behaviour” (e.g., compliance with food hygiene rules), and if we assume that more compliance dominates less compliance with regard to the regulator’s final benefits, we may attempt an operational definition of “smart regulation” by resorting to a cost-effectiveness analysis that is concerned with behavioural effects. Due to informational constraints, regulators will rarely be able to identify the cost-efficient set of regulatory measures. Instead, they will be limited to conceiving and analyzing a limited number of discrete regulatory alternatives which may or may not belong to the cost-efficient set. Hence, we should exchange the futile quest for smart regulation with the more realistic search for *smart regulatory change*. Figure 2 illustrates the conceptual background and describes the corresponding possibilities to obtain an operational definition of smart regulatory change.



**Fig. 2** Smart regulatory change

Smart regulatory change can be conceived as a relative concept based on the comparative method and the dominance principle. Correspondingly, we qualify a regulatory change as smart if it dominates the regulatory status quo, i.e., if it produces more compliant behaviour at identical or lower regulatory costs, or if it produces an identical amount of compliance at lower costs. The set of regulatory innovations that come into consideration may be limited by two additional factors: first, the regulator's choices may be constrained by a pre-defined budget that is smaller than the budget in the status quo. Second, the regulator may have defined a compliance threshold (minimum effectiveness constraint) that further reduces the choice set which comes into question. For the sake of completeness, one should add that some regulatory alternatives may increase the level of compliance but incur higher regulatory costs. The relative competitiveness of such non-dominant changes (their smartness) can only be evaluated after the outcome (e.g., the reduction of hospitalizations due to food poisoning) has been approximately mapped into monetary units.

#### 4 Contributions to the special issue

Against the background of a pervasive and ever more important search for better governance and regulatory improvements in the agri-food system, this Special Issue is aimed at consolidating knowledge regarding the functioning and performance of network governance and regulation structures. The papers in this issue address public regulation and the regulatory efforts of private actors in equal measure. One paper is explicitly concerned with the comparison between private and public regulation. While each contribution focuses on different aspects and fields, and while each of them uses a different approach, they make in their entirety a significant contribution to a more complete understanding of networked regulation in the global agri-food system. We thus hope and believe that both practitioners and scholars who have an interest in food regulation will benefit from this issue.

In the first article titled “Novel food for thought”, Neuwirth explores the problem that regulation needs to be adapted on multiple levels to the fast, drastic and continuing changes in the world's food production without compromising the integrity and predictability of the law over time. Focusing on what he calls the “creative food economy” and the production of novel food as engineered by the use of bio- and nanotechnologies, the author concerns himself with the adaptation requirements on the international and domestic levels, the latter being exemplified by the situation in the EU and the People's Republic of China. Neuwirth identifies deficiencies in the institutional design of the current legal framework and concludes that, globally, there is a “regulatory mess” which is manifested in the fragmentation of international law, as well as in the lacking of consistency between general international law and trade law, between public international law and private international law, and, ultimately, between the international regime and the many divergent national legal systems.

The second article, by Desquilbet and Poret, is concerned with coexistence regulations for GM and non-GM crops. The authors use a formal economic model to

analyse how the joint imposition of mandatory *ex ante* safety regulations and *ex post* liability rules on the producers of GM crops affect markets and welfare. Starting from the fact that GM labelling has become mandatory on the premise that consumers have a right to information and, in accordance with the predominant consumer preference in the European Union, Desquilbet and Poret assume that GM products are considered as inferior goods by consumers. Due to imminent gene flows from GM to non-GM fields, the cultivation of GM crops generates negative externalities for non-GM crop producers who strive to prevent commingling above the labelling threshold to prevent harvest downgrading. As a result of their formal model, the authors find that the combination of mandatory *ex ante* safety measures (isolation distances) and *ex post* compensations in case of damage may encourage the coexistence of GM products and non-GM products on the market while minimizing social welfare losses.

The third article, by Fagotto, resorts to law and economics to identify the comparative strengths and weaknesses of public, as opposed to private, food safety regulation. Fagotto studies whether private standards, which are so widespread that they have become *de facto* mandatory for many suppliers, can achieve the public-interest objective to protect consumers' health. She furthermore asks whether private standards are substitutes or valuable complements of public regulation. Fagotto argues that private food standards tend to facilitate compliance for three reasons: first, they induce food businesses to use their unique internal capacity and knowledge to detect and manage internal risks. Second, they make food businesses undergo periodic audits which are more frequent than random government inspections. Third, they generate strong economic incentives to comply since food businesses want to secure market access. Due to the very fact that they are private in nature, private standards also have shortcomings. They are negotiated and applied without much public scrutiny and may privilege private interests over consumer protection. Furthermore, their enforcement relies on third-party certifiers who may be captured by the firms they should audit.

In the fourth paper, Rouvière and Latouche analyze how liability rules for food safety deficiencies affect the coordination in the food supply chain. Against the background of the implementation of the European General Food Law into national law, they study provisioning decisions of French retailers who sell fresh Spanish produce. The authors focus on the transfer of liability. In France, the first supplier who places products on the domestic market bears the liability. Import decisions at the French border are thus crucial indicators to understand how the liability rule shapes the supply chain. Retailers are confronted with a *make-or-buy* decision. They can import fresh products themselves and bear the liability (*make option*), or they can use an importer and thus delegate the liability (*buy option*). The authors show that in the wake of the regulatory change in 2005 (i.e., the introduction of the liability regime), French supermarkets have increasingly transferred the liability risk to importers. They also find that the regulatory change has prompted French importers of fresh produce to develop a horizontal and collective governance structure to ensure quality and safety.

In the last contribution to this issue, Cafaggi and Iamicelli concern themselves with transnational contracts and agreements in global food supply chains. They

focus on agreements which combine regulatory safety and sustainability provisions with certification arrangements. The incorporation of certification regimes is understood as a special form of contractual design adopted by supply chain actors to overcome the weaknesses of conventional bilateral contracts. The authors argue that conventional contracts between individuals tend to be product-oriented and reactive approaches that are predominantly aimed at redressing the victim for damage suffered after a breach of contract. Agreements that combine regulatory provisions with certification obligations, in contrast, are seen as process-oriented and proactive approaches that account for the interdependence of contractual relationships along the whole chain and that are mainly aimed towards the prevention of contract breaches.

## 5 Closing words

Emphasizing the knowledge gaps and the continuing need for more regulatory research both in the food industries and other domains, we would like to conclude our introductory editorial by quoting some words of Braithwaite et al. (2007: 4) that have already inspired our endeavours as editors: “[...] we should not be surprised that innovations in networked regulation capture the imagination of big thinkers and practical doers alike about the direction the world is heading. [...] we see the promotion of better regulatory studies as a worthy way of understanding and improving the world around us. Bad regulation, after all, can do terrible damage to people. Good regulation can control problems [...]. Regulation matters, and therefore the development and empirical testing of theories about regulation also matter. Because regulation and regulatory studies make a crucial difference in the lives of millions of people, all of us in the intellectual community of regulatory scholars need to become more demanding than we have been about theoretical rigor and empirical evidence.”

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# Producing compliant business behaviour: disclosure of food inspection results in Denmark and Germany

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**Abstract** Public disclosure of food inspection results (“name-and-shame”) is increasingly used to promote compliance with food regulations. Name-and-shame measures tackle the problem of market failure by increasing transparency, strengthening the sovereignty of consumers and enabling them to make informed choices. Consumers prefer to buy from compliant food businesses. If information on compliance is successfully conveyed to consumers, non-compliant businesses will face a competitive disadvantage. They will be sanctioned not only by the state but also by a loss of market share. Additionally, social sanctioning from “relevant others”, such as friends and regular customers, may be linked with market sanctions. Both economic and social sanctions further the motivation to comply. Name-and-shame measures are thereby expected to effectively increase compliance with food regulations while keeping costs low for tax payers. Regulatory strategies which are both effective and cost-efficient are said to be “smart”. A prerequisite of smart regulatory approaches is that they are legally viable within a nation’s legal and constitutional environment. Against this background, and with a view to the current political discussions regarding the introduction of a public disclosure system in Germany, we carry out a comparative analysis of the well-established Danish smiley scheme and three pilot projects

in Germany. Aiming at identifying the potential for improvement, we address the institutional design of these systems as well as their effectiveness and costs.

**Keywords** Consumer protection · Compliance · Food safety · Name-and-shame · Scores-on-doors · Smart regulation · Smiley scheme · Transparency

## 1 Introduction

The Communication “Smart Regulation in the EU” published in October 2010 sets out the EU Commission’s plans to further ensure the quality of regulation (EU Commission 2010). Smart regulation aims at regulating effectively and efficiently where there is a need to do so. The need for regulatory intervention exists when markets fail without intervention. One important cause of failing markets is the lack of transparency (Fung et al. 2007; Sinn 2003). In the food sector, transparency is often lacking since consumers are usually neither fully informed about the quality of products nor about the quality of production processes.

Regulatory strategies must meet three conditions to be smart: first, they can only be applied successfully if they are *legally viable* within a nation’s legal and constitutional environment. Second, they have to be *effective* in that they change the behaviour of businesses in a significant way and in the direction intended by the policymaker. Effective strategies in the food sector are those that produce behaviour compliant with food law, thus meeting the political objectives of both improving food safety and guaranteeing the

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free and informed choice of consumers. Third, smart strategies need to achieve the political objectives in a *cost-efficient* way. That is, their costs and the resulting burden to the taxpayers must be justified by the improvements for consumers which, moreover, should be fast and visible (Reisch 2004).

Food authorities increasingly use transparency schemes including “name-and-shame” (i.e. mandatory disclosure of inspection results) to advance the regulatory goal. The schemes that have been put in practice in various countries differ in many variables. The precise institutional design of transparency regimes determines whether and to which extent the above-mentioned conditions for smart regulation are met. Unfortunately, the following statement, even though made in 2005, still applies today: “There is [...] a paucity of peer-reviewed publications on the public health effectiveness of disclosure or grading systems in the literature” (Worsfold 2005:168). A few empirical studies exist, however, which assess the effectiveness and/or efficiency of disclosure regimes. Spear (2006) found that six months after the introduction of mandatory disclosure of hygiene inspection results in New York, the rate of satisfactory compliance increased from 21 % to 63 %. Jin and Leslie (2003) studied the effects of publishing hygiene inspection results in the restaurant sector in Los Angeles. They observed an improvement of hygiene, a reduction of food-related hospitalizations, and a significantly lower income of restaurants with a bad evaluation. Similarly, Weil et al. (2006) summed up the empirical results from studies in the US and concluded that the publication of inspection results is very effective with restaurants.

According to a survey in Germany carried out by the polling institute Emnid, 87 % of the respondents supported publication of food inspection results (Maurin 2009). The respondents want food authorities to adopt a “scores-on-doors” policy similar to the smiley system in Denmark where food inspection results are communicated to consumers via easily comprehensible pictograms in the premises of food shops and restaurants (DVFA 2011). However, so far only a few pilot transparency schemes have been introduced in Germany the participation in which is largely voluntary due to concerns whether the consumer information law (Verbraucherinformationsgesetz, VIG 2010) and the German Food and Feed Code (Lebensmittel- und Futtermittelgesetzbuch, LFGB 2010) provide a sufficient legal basis for compulsory disclosure.

Against this background, this article subjects three German pilot projects to a comparative analysis in which the Danish smiley scheme is used as a

benchmark. The objective of the comparison is to identify the essential design variables that differ between these systems and to analyse how these differences affect the competitiveness of the investigated regimes in terms of effectiveness and cost efficiency.

## 2 Regulation through transparency

### 2.1 Effectiveness and cost efficiency of disclosure systems

The effectiveness of disclosure strategies depends on reputation effects. Authorities can make use of reputation by providing information on inspection results to buyers, be they downstream food businesses or consumers (Jahn 2003). Financial losses resulting from a deterioration of reputation can be severe due to the fact that most buyers prefer to buy from compliant businesses. Besides financial losses, disclosure may also affect the social relationships of food business operators (e.g. with business associates, customers, neighbours, friends) and provoke social sanctioning. The anticipation of social disapproval and sanctioning further motivates food producers to comply with regulations. In his “re-integrative shaming theory” Braithwaite (2003) argues that the ways in which societies, communities, and families sanction deviance affect the extent to which their members engage in deviant behaviour. Disclosure policies can be understood as being aimed at increasing the total amount of compliance by consistently complementing state-administered sanctions with market-based and social sanctions. While deterrence approaches which are exclusively based on penalties and fines are reported to crowd out positive intrinsic motivation (Frey and Jegen 2001; Ostrom and Walker 2003), transparency measures are said to avoid the dysfunctional effects of pure deterrence such as crowding out and reactance (Miron and Brehm 2006) by generating value correspondence between the lawmaker and those affected by the law (Tyler 2006). Accordingly, market-based sanctions are assumed to interact positively both with intrinsic values and social sanctions because food business operators, accustomed to seeing themselves as competitive entrepreneurs, as well as their social environment will accept sanctions that result from transparent markets as legitimate. They will consider more severe state-administered sanctions, however, as an illegitimate interference with their entrepreneurial liberty of action.

The cost efficiency of regulatory strategies aimed at steering behaviour is a function of their outcome (i.e. the behavioural change) and their costs. While consumers' search costs for being informed could be included into the cost consideration from a welfare point of view, we evaluate the cost efficiency of regulatory strategies from the taxpayers' point of view. We consider the fact, however, that the effectiveness of disclosure systems depends on how well the information reaches the respective consumers. We call this the "degree of information spread". Low search costs are crucial for a successful perception of the information by consumers. High search costs would reduce reputation effects and impair regulatory effectiveness. Presenting highly condensed information via scores or smileys reduces both the costs of finding and the cost of understanding the disclosed information (Fielding et al. 1999).

## 2.2 Unfavourable effects of disclosure systems

The disclosure of food inspection results may cause several unfavourable effects the extent of which depends on the specific design of various system variables.

1. Regulatory authorities cannot fully control the outcome of their publication policy. One problem might be that sensation-seeking media present the information in a way which causes disproportionate damage to the respective company (van Erp 2007).
2. Some food businesses might lack the professional capability to comply with regulations. If so, disclosure without concomitant support may backfire and lead to demoralization and defiance (van Erp 2007). Individual counselling, the provision of information and capacity building would be needed to promote compliance in such instances.
3. Disclosure of negative inspection results may cause economic losses that are more severe and punitive than fines even though only an administrative body, not a court of law, has established the offender's "guilt". Disclosure may thus violate the presumption of innocence and the principle of proportionality - unless "due care has been exercised, a compelling reason for publication is available, audi et alteram partem is observed, [and] the company is given the opportunity to react in advance" (van der Meulen 2007:277). To be judicially feasible, disclosure is subject to strict requirements regarding the reliability and objectivity of inspection standards. Furthermore, formal hearings may be a procedural precondition for the adoption of disclosure schemes from a legal point of view.
4. Name-and-shame will only cause proportionate effects and enable consumers to make informed choices if, and only if, the inspection results are communicated clearly and well understood by consumers. An appropriate perception of a company's compliance behaviour and an informed choice on the part of consumers may require that more information than just the current inspection results is published.

## 3 Transparency schemes in Denmark and Germany

In the following section we briefly describe the three German transparency projects and compare them with the smiley scheme in Denmark. The Danish scheme is used as a benchmark for the following reasons:

1. The Danish smiley scheme is very well known and scores an astounding 100 % on consumer awareness (DVFA 2011).
2. It seems that value correspondence between the regulator and the food businesses has been achieved. Nearly 90 % of the concerned businesses agree that the smiley scheme is "a good or very good idea" and that the individually assigned smiley is fair (DVFA 2011).
3. The scheme enables consumers to make more informed choices and is thus effective from a consumer protection point of view. Nearly 100 % of consumers agree that the smiley scheme is "a good or very good idea". Accordingly, they use the conveyed information in their consumption decisions. About two thirds of consumers would reject a restaurant with a bad smiley. Nearly 60 % have done so in the past (DVFA 2011).
4. The scheme has successfully changed the behaviour of food businesses in the way intended by the policymaker. The rate of fully compliant enterprises has increased from 70 % in 2002 to 86.7 % in 2010 (DVFA 2011).

### 3.1 The smiley scheme in Denmark

A nation-wide smiley scheme was established in Denmark in 2001 (Torp 2007). Initially smileys were only assigned to retail businesses and restaurants. In

March 2008 an additional “elite-smiley” was introduced and the non-retail sector was included (Fig. 1). Businesses are awarded the elite-smiley if they were rated “1” in the last four inspections and if no objections occurred within the last 12 months. Businesses which do not sell food to consumers (e.g. wholesalers, slaughterhouses) can receive only the elite-smiley.

Food inspections take place without advance notice and the risk-oriented approach is explicitly rooted in the inspection procedures. That is, the inspection frequency depends on the field of action which determines the risk group a business belongs to. Risk-sensitive businesses, such as hospital kitchens, are inspected three times per year, less risk-sensitive businesses, such as shops selling packaged food, only once in two years. Businesses with the elite-smiley are considered to be less risky from a behavioural point of view and thence inspected with a lower frequency than their peers in the same field of action. This enables the food authority to direct its scarce resources to the behavioural hot spots.

The smileys indicate the degree of compliance and appear at the top of the food inspection report. In addition to the current smiley, the smileys of the preceding three inspections are also published. The type of smiley which is assigned depends on the worst inspection result in the fields of hygiene, hygiene training, presence of required licences, and due display of the inspection report (Torp 2007). Retail businesses (supermarkets, bakeries, butchers, greengrocers, kiosks, restaurants, canteens, hospital kitchens etc.) have to post the inspection report visibly in the business premises. On its homepage, the Danish Veterinary and Food Administration (DVFA) further specifies: “The reports must also be placed easy to find on the enterprises own homepages. All reports for the last four inspections are available at <http://www.findsmiley.dk> (DVFA 2011).” The inspection reports of wholesale companies are published on

the internet only. Food businesses which receive a not-happy smiley are re-inspected „within a reasonable time“. While ordinary inspections are free of charge, re-inspections are liable to charges, thus providing an additional incentive for compliance in the first place.

### 3.2 German transparency schemes (pilot projects)

#### 3.2.1 The Hygiene Passport Zwickau

In March 2007 the local food authority in the city of Zwickau in the Free State of Saxony introduced the “Hygiene Passport Zwickau”. Between the introduction of the passport in 2007 and its abandonment in 2010, more than 300 out of approximately 600 eligible businesses participated in the scheme (ZWICKAU 2009). The system was abandoned even though citizens considered it a good idea (Baier et al. 2008). The cost burden for the tight municipal budget was the reason for its abolishment. Recently, the introduction of a smiley scheme is being discussed on the level of the Free State of Saxony (Medienservice Sachsen 2010). The Zwickau scheme is considered as a relevant experience and model for the envisaged Saxony-wide system. This is why it is described here even though it is not implemented at present.

The Zwickau Hygiene Passport was a voluntary award system in which only information on “good” enterprises was published. Food businesses were offered the opportunity to sign an agreement with the local food authority. The contract included the following specifications: first, a participation fee of 15 € was to be paid in the beginning. Second, inspections continued to be carried out without advance notice. Third, the participating food business received a “notice board” for its business premises on which the rating and the date of the last inspection were displayed. Fourth, the rating and the full inspection

**Fig. 1** Pictograms used in the Danish smiley scheme

Elite	1	2	3	4
Elite-smiley: a rating of "1" was awarded four consecutive times				
Score 1: inspector had no remarks				
Score 2: inspector emphasized that certain rules must be obeyed				
Score 3: inspector issued an injunction order or a prohibition				
Score 4: inspector issued an administrative fine, reported the enterprise to the police, or withdrew an approval				

report were additionally published on the internet (<http://www.hygiene-pass.de>). Fifth, depending on the hygienic conditions, grades in the form of scores between 1 point (“without health risk”) and 5 points (“far above average”) were assigned. Sixth, the hygiene passport was only awarded to businesses which reached at least 1 point. Seventh, the agreement could be terminated by the food business at any time.

### 3.2.2 The smiley scheme in North Rhine-Westphalia

In 2007 North Rhine-Westphalia (NRW) established the pilot project “NRW-Smiley” (NRW 2011). The NRW-smiley is also a voluntary award scheme. As of 2011, 14 of the state’s 31 administrative districts have adopted the scheme. To begin with, the smiley was assigned to restaurants only. The project was later expanded to food businesses such as bakeries or butchers which sell unpacked or slightly perishable food to consumers. Participation is free of charge, but requires a written agreement with the NRW Ministry for Consumer Protection in which the food business agrees that its inspection data may be passed on to the ministry.

Regular inspections by the local food authority continue to be carried out without advance notice. The authority evaluates the company’s compliance using a list of 18 criteria. For each criterion ratings from 1 (very good) to 5 (insufficient) are assigned. A quality certificate including the smiley (Fig. 2) is awarded to businesses which score 2 (good) on average over the 18 criteria. In addition, no criterion may be worse than 3 (satisfactory). The certificate can be displayed in the business premises until the next inspection. A list of businesses that were awarded the certificate is additionally published on the ministry’s homepage (<http://www.munlv.nrw.de/verbraucherschutz/lebensmittel/smiley/index.php>).

### 3.2.3 The smiley scheme in Berlin-Pankow

In January 2009 the local food authority of Berlin-Pankow established a smiley scheme for restaurants

and retail businesses. The aim of the project is to lower the high objection quota of 30 % in the catering sector (PANKOW 2011). The Pankow food authority mentions the Danish smiley scheme explicitly as a reference model.

The Pankow smiley scheme is different from the two other German schemes in that it combines voluntary participation in its smiley scheme (which is a quality award system) with the compulsory disclosure of businesses with a very bad compliance record. Participation in the quality smiley scheme requires a written agreement with the Pankow district administration. Again, regular inspections continue to be carried out without advance notice. The food authority evaluates the company’s compliance using an evaluation sheet with a total of 32 criteria in eight inspection areas. The Pankow-Smiley is only awarded to businesses which obtain more than 90 % of all possible points in the inspection. In this case, a certificate and a sticker with logo (Fig. 3) are handed out to be displayed in the business premises. In addition all businesses that were awarded the quality smiley are published in a “positive list” on the authority’s homepage (<http://www.berlin.de/ba-pankow/verwaltung/ordnung/smiley.html>).

While abstaining from a mandatory display of not-happy smileys in the premises, businesses with serious deficits are published in a “negative list” on the authority’s homepage. Publication only takes place if this seems to be adequate after a formal hearing process and the consideration of the interests both of the business and the public according to § 4(1) VIG. In general, gross and/or repeated violations of food regulations are published. In the case of disclosure, photos are provided additionally in order to inform consumers of the shortcomings.

As a result of the combination of voluntary and compulsory publication elements, the Pankow system produces three classes of enterprises. Unfortunately, from a transparency point of view, only two of them are unambiguous:

Fig. 2 NRW-Smiley



Fig. 3 Pankow-Smiley

- Businesses *with a smiley* and with a reference in the positive list have performed (very) well in the areas of hygiene and quality according to the last food inspection.
- Businesses *without a smiley, but with a reference on the negative list* have serious deficits in the areas of hygiene and quality according to the last food inspection.
- Businesses *without a smiley and with no reference on the negative list* form an ambiguous class which includes (1) businesses which have chosen not to participate in the scheme, (2) businesses with minor deficits, and (3) businesses which have not been published on the negative list despite serious deficits because the authority, after weighing the interests of the business and the public according to § 4(1) VIG, has decided against publication.

### 3.3 Comparison of the four transparency systems

A clear-cut comparison of the effectiveness of different disclosure systems by means of a formal quantitative model is not feasible due to the high systemic complexity of the system. We must thence resort to a theory-based but qualitative assessment of the design variables' impact on the regulatory goal. The theory in terms of the functional relationships between a system's design variables and its power to produce compliant behaviour through reputational effects is briefly summarized in Figure 4.

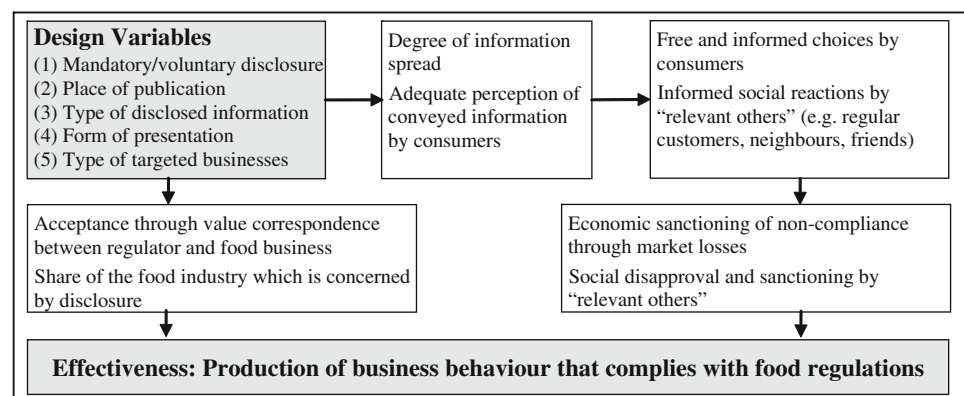
Aiming at assessing the effectiveness of the schemes under consideration in terms of their potential to produce compliant behaviour we carry out a value-benefit analysis using a linear additive scoring model (Tab. 1). The model is based on the functional relationships described in Figure 4. Each variable's impact on effectiveness is assessed by attributing a weight (between 5 % and 50 %) and a score (between zero and three points).

Ad (1) (Tab. 1): The most important design variable is whether the publication of inspection results is mandatory or voluntary. Voluntary schemes necessarily carry the character of quality award schemes. Their very design causes much ambiguity because consumers do not know whether a missing quality award implies that the business failed the inspection, or whether it simply implies that the business has chosen not to participate in the scheme. Consequently, voluntary systems increase the degree of information spread only marginally. This, in turn, results in low reputational and behavioural effects – unless a voluntary quality award scheme becomes the generally expected standard within an industry. In this case, non-participation, and thus the absence of the quality award, becomes a negative signal in its own right which clearly indicates below-standard compliance behaviour. None of the German systems under consideration have reached this point. While the purely voluntary schemes in Zwickau and NRW were thence attributed 0 points, the Pankow scheme was assigned 2 (out of 3) points because it reduces the ambiguity by combining voluntary participation in a quality award scheme with the compulsory disclosure of businesses with serious deficits.

Ad (2) (Tab. 1): The design variable “place of publication” is identical for all four schemes. All schemes were assigned 3 points for this variable because the information is always easy to find. In all schemes it is displayed clearly and visibly in the business premises and is also easily accessible on the internet. As a result, the search costs for consumers are low. This, in turn, impacts positively on the degree of information spread and the reputational and behavioural effects.

Ad (3) and (4) (Tab. 1): The extent of the published information and the form of its presentation are closely linked. Publishing full inspection reports (for those who are genuinely interested in a company's behaviour) conveys the maximum amount of information. Hence,

**Fig. 4** Functional relationships between the essential design variables of disclosure schemes and their power to produce compliant behaviour



**Table 1** Comparison of selected transparency schemes

Design variable (weight)	E v a l u a t e d t r a n s p a r e n c y s c h e m e s			
	Danish smiley (benchmark)	Zwickau Hygiene Passport	NRW-Smiley	Pankow-Smiley
(1) Conditions of publication (50 %)	Mandatory; 3 (+++)	Voluntary; 0	Voluntary; 0	Partly voluntary, partly mandatory; 2 (++)
(2) Place of publication (20 %)	In the premises and on the internet; 3 (+++)	In the premises and on the internet; 3 (+++)	In the premises and on the internet; 3 (+++)	In the premises and on the internet; 3 (+++)
(3) Extent of published information (5 %)	Full inspection report; 3 (+++)	Full inspection report; 3 (+++)	Abridged results only; 0	Abridged results only and photos; 1 (+)
(4) Form of presentation (5 %)	Five smiley types, inspection report; 3 (+++)	Hygiene passport with 5 grades; 3 (+++)	Certificate with 1 type of smiley; 1 (+)	Certificate with 1 type of smiley; 1 (+)
(5) Companies targeted (20 %)	Entire food chain; 3 (+++)	Entire food chain; 3 (+++)	Gastronomy, retail; 2 (++)	Gastronomy, retail; 2 (++)
<b>Total score</b>	<b>3</b>	<b>1.5</b>	<b>1.05</b>	<b>2.1</b>

the Zwickau and Pankow schemes were attributed 3 and 1 points, respectively, while the NRW scheme, which provides only very abridged positive information on compliance, received 0 points. As to the form of the presentation, 3 points were attributed to the schemes which presented the information in an easy-to-understand, but nevertheless differentiated manner. The schemes with only one type of smiley, in contrast, received 1 point.

Ad (5) (Tab. 1): Last but not least, the impact of a transparency scheme depends on the proportion of the food industry it is applicable to. It is certainly reasonable to start with businesses selling food directly to consumers because the lack of transparency is particularly pronounced in this field. However, other seller-buyer dyads will also profit from an increase of transparency. Hence, the schemes addressing the entire food chain were attributed 3 points, whereas those restricted to the last chain level were attributed 2.

According to the value-benefit analysis in Table 1, the Pankow scheme achieved a total score of 2.1 (out of 3) points, while the Zwickau and NRW schemes achieved 1.5 points and 1.05 points, respectively. The main advantage of the value-benefit analysis is that non-quantitative (“soft”) criteria can be taken into account and that the evaluation procedures are made transparent. Methodical transparency is achieved with regard to (1) the selection of the criteria (here: the design variables), (2) the weights attributed to each criterion, (3) the rating scale (here: from 0 to 3 points),

and (4) the scores attributed to each criterion. While the scores that have been attributed to each criterion in Table 1 are based on a theoretical understanding of human motivation, they remain subjective. That is, other evaluators might find other scores. However, within a plausible range the rank order of the schemes under consideration remains stable. Rather than understanding the achieved total scores as metric measures of the respective scheme’s quality, they should thence be understood as providing an ordinal measure (i.e. a rank order).

While the measures used to prevent unwanted effects (Sect. 2.2) in mandatory disclosure systems have not entered the evaluation in the scoring model of Table 1, they seem to have been largely avoided in the Pankow scheme. Four procedural steps which are taken before a business is published on the negative list are responsible for this: a formal hearing process is carried out; a formal consideration of the interests of the business and the public is effected by the food authority; early re-inspections are carried out in the case of serious deficits; and remedied deficits are not published.

Comparing the relative competitiveness of different alternatives generally requires that not only their effectiveness, but also their costs are considered. We do not possess data on the administrative cost of the various activities of the food authorities under consideration. We believe, however, that the costs of the different transparency systems are both relatively low

and on a comparable level for two reasons: first, the relevant costs comprise only the incremental costs of implementing the scheme, whereas regular inspection costs, representing the bulk of the costs, are caused anyhow, i.e. independent on whether a transparency scheme is established or not. Second, no additional sanctioning and enforcement costs arise from the transparency schemes because, from the food authority's point of view, the task of sanctioning is "outsourced" to the market and the social community. Arguing that the costs for the taxpayers are low and quasi-invariant between the various schemes we can resort to the dominance principle. This implies that the rank order obtained in the scoring model for the effectiveness of the schemes represents also the rank order regarding their cost efficiency.

#### 4 Conclusions

As result of our value-benefit analysis we find that, with regard to effectiveness and cost efficiency, the Pankow scheme comes second to the Danish, while the purely voluntary systems in Zwickau and NRW are clearly outranked by the other two.

For countries which are comparable to Denmark in their basic economic and social situation, the Danish scheme can be seen as a large-scale controlled field trial the experiences of which can be exploited with very little cost. The Danish scheme seems to be a success story. This raises the question why, instead of re-inventing the wheel, it is not copied in other countries after a critical reflection of eventually varying circumstances and necessary prerequisites and modifications.

In Germany, constitutional and legal concerns are, as yet, an obstacle to the introduction of a smiley scheme. The political initiative to expand the Pankow scheme to all other Berlin district administrations by the first of July 2011 was halted, e.g., because of legal concerns of Berlin's Senate administration regarding the publication of non-compliant businesses on the negative list. However, at present, there is an initiative on the federal level to generate a clear legal basis for a nation-wide implementation of name-and-shame measures. This initiative is supported by the Minister for Agriculture and Consumer Protection, Ilse Aigner.

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# *Die Wirkung von veröffentlichten Hygienekontrollen auf Lebensmittelunternehmen: das Beispiel “Berliner Smiley”*

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# Die Wirkung von veröffentlichten Hygienekontrollen auf Lebensmittelunternehmen: das Beispiel “Berliner Smiley”

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**Zusammenfassung** In dieser Arbeit haben wir den Einfluss von immateriellen Determinanten auf das Entscheidungsverhalten von Lebensmittelunternehmen untersucht. Eine solche Analyse ist vor dem Hintergrund der aktuellen Diskussion um Transparenzsysteme in Deutschland von besonderer Bedeutung. Um die Wirkung der sog. „Smiley-Systeme“ bewerten zu können, haben wir eine empirische Untersuchung unter Lebensmittelunternehmen in den Berliner Bezirken Pankow, Lichtenberg und Marzahn-Hellersdorf durchgeführt, da dort ein deutschlandweit einmaliges Pilotprojekt der verpflichtenden Veröffentlichung der Ergebnisse der behördlichen Kontrollen eingeführt wurde. In die empirische Untersuchung konnten 186 Unternehmen einbezogen werden. Mit Hilfe eines *Generalized-Ordered-Logit*-Modells testeten wir den Einfluss verschiedener Verhaltensdeterminanten auf die Compliance (als abhängige Variable), differenziert nach Art des Lebensmittelunternehmens (Restaurants oder nicht). Unsere Ergebnisse deuten darauf hin, dass die Wirkung des Smileys auf die Verhaltensdeterminanten, in Abhängigkeit von der Unternehmensart, differiert. Obschon die Wirkung des Smileys unterschiedlich ist, fanden wir signifikante Einflüsse auf die Compliance bei allen Unternehmen. Somit verfügen Transparenzsysteme

über das Potenzial, das unternehmerische Verhalten in die gewünschte Richtung zu beeinflussen.

**Schlüsselwörter** Verhaltensmotive · Compliance · Transparenzsysteme · Generalized-Ordered-Logit

## 1 Einleitung

Die wiederkehrenden Lebensmittelskandale der jüngeren Vergangenheit indizieren, dass der Normappell der Gesetze nicht ausreicht, um Unternehmer von eigennützigem und regelverletzendem Verhalten abzuhalten. Bei einem Verstoß gegen lebensmittelrechtliche Vorschriften erhöht sich die Wahrscheinlichkeit von Negativwirkungen auf den Verbraucher. Aus Regulierungssicht verursacht ein Verstoß einen negativen externen Effekt (z. B. eine Gesundheitsgefährdung der Verbraucher), den man durch die entsprechende Vorschrift verhindern wollte.

Weltweit werden zunehmend Transparenzsysteme in Form einer Veröffentlichung der behördlichen Kontrollergebnisse eingesetzt, um die Compliance zu fördern. Obschon diese Systeme wegen möglicher negativer Effekte umstritten sind (Bavorová und Hirschauer 2012; Ho 2012), können sie als effektive Steuerungsinstrumente betrachtet werden. Sie haben das Potenzial, Intransparenzen des Marktes und Unsicherheiten beim Verbraucher zu verringern (Fung et al. 2007) und somit die bestehenden Informationsasymmetrien zu reduzieren.

Im Berliner Bezirk Pankow wurde im Pankow (2008) ein Transparenzsystem in Anlehnung an das dänische Smiley-System eingeführt (sog. Pankower

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Smiley). Die verpflichtende Veröffentlichung der behördlichen Überwachungsergebnisse erfolgte mittels eines vor Ort angebrachten Smiley-Piktogramms sowie parallel auf der Homepage der Behörde (Abb. 1). Dieses System wurde kongruent in den Bezirken Lichtenberg und Marzahn-Hellersdorf übernommen. Die dort lokalisierten Lebensmittelunternehmen sind somit die einzigen Unternehmer deutschlandweit, die über mehrjährige Erfahrungen mit verpflichtenden Veröffentlichungen verfügen. Für diese Arbeit wurden die dort ansässigen Unternehmen mittels eines schriftlichen Fragebogens kontaktiert.

Ausgehend von den Veröffentlichungen der Ergebnisse des Jahresberichts 2013 der Bundesrepublik Deutschland zum mehrjährigen nationalen Kontrollplan nach Verordnung (EG) Nr. 882/2004 kann man unterschiedliche Wirkungen der Veröffentlichung der Kontrollergebnisse in Abhängigkeit von der Unternehmensart erwarten. Die Restaurants weisen im Vergleich zu anderen Lebensmittelunternehmen höhere Verstoßquoten auf (34,1 %), werden aber vergleichsweise weniger häufig kontrolliert (Kontrollintensität 1,5 = Zahl der Kontrollbesuche der Behörde/Gesamtzahl der kontrollierten Betriebe). Betrachtet man die

Unternehmensart Restaurants (auch Dienstleister inkludiert: Restaurants, Caterer, Fast Food), so beträgt ihr Anteil an der Gesamtzahl aller Lebensmittelbetriebe in Deutschland ca. 45 %, demzufolge kann von einer starken Konkurrenzsituation in dieser Branche ausgegangen werden [Bundesministerium für Ernährung und Landwirtschaft (BMEL) (2014)]. Weiterhin deuten erste Analysen der mittels Fragebogen erhaltenen Daten darauf hin, dass sich die Wirkung von Transparenzsystemen in Abhängigkeit von der Unternehmensart unterscheidet. Durch die getrennte Betrachtung der Wirkungen von Transparenzsystemen (abhängig von der Unternehmensart) kann analysiert werden, ob es empfehlenswert ist, alle Lebensmittelunternehmen in solche Systeme zu inkludieren (in Anlehnung an das dänische Smiley-System), und ob sich die Veröffentlichungen ähnlich auswirken.

Vor diesem Hintergrund zielt diese Forschungsarbeit darauf ab, zu einem besseren Verständnis von Compliance bzw. Non-Compliance, unter besonderer Berücksichtigung der Auswirkungen von Transparenzsystemen, beizutragen. Mithilfe einer empirischen Analyse untersuchen wir die Effekte von verpflichtenden Veröffentlichungen auf die Compliance in

## KONTROLLERGEBNIS

**BETRIEB** Max Mustermann  
13187 Berlin Musterstr. 1

**BETRIEBSART** Cafes/Milchbar/Eisdiele ohne eigene Herstellung

**BETROFFENE LEBENSMITTEL** Feine Backwaren, Kaffee Kaffeeersatzstoffe Kaffeezusätze, Zubereitete Speisen a. Gaststätten Kantinen u.ä.

BISHERIGES VERHALTEN DES BETRIEBES	mögliche Miuspunkte	vergebene Miuspunkte
Mitarbeiterschulung	7	2
<b>VERLÄSSLICHKEIT DER EIGENKONTROLLEN</b>		
HACCP-Verfahren / Eigenkontrollen	12	0
Untersuchung von Produkten / Wareneingangskontrolle	5	0
Temperatureinhaltung	8	0
<b>HYGIENEMANAGEMENT</b>		
Bauliche Beschaffenheit / Instandhaltung	5	0
Reinigung und Desinfektion	8	0
Personahygiene	11	0
Produktionshygiene / Betriebshygiene	13	0
Schädlingsbekämpfung / Befallskontrolle	3	0
<b>Punktzahl</b>	<b>72</b>	<b>2</b>

**NACHKONTROLLE**

**DATUM** \_\_\_\_\_


**MÄNGEL WURDEN BESEITIGT** \*\* vollständig \*\* überwiegend \*\* teilweise \*\* nicht

**Bezirksamt Pankow von Berlin**  
Abteilung Verbraucherschutz, Kultur, Umwelt und Bürgerservice - Fachbereich Veterinär- und Lebensmittelaufsicht

**AKTUELLES KONTROLLERGEBNIS**

**DATUM** 17.01.2014

**PUNKTZAHL** 2

**ERGEBNIS** sehr gut 

**VORHERIGE KONTROLLERGEBNISSE**

**DATUM** \_\_\_\_\_

**ERGEBNIS** \_\_\_\_\_

**PUNKTZAHL** \_\_\_\_\_

**DATUM** \_\_\_\_\_

**ERGEBNIS** \_\_\_\_\_

**PUNKTZAHL** \_\_\_\_\_

**DATUM** \_\_\_\_\_

**ERGEBNIS** \_\_\_\_\_

**PUNKTZAHL** \_\_\_\_\_

**LEGENDE**

😊 0 - 2 sehr gut  
 😊 3 - 20 gut  
 😐 21 - 38 zufriedenstellend  
 😐 39 - 55 ausreichend  
 😐 56 - 72 nicht ausreichend

Abb. 1 Originale Darstellung eines Formblattes zur Veröffentlichung der Inspektionsergebnisse (Bezirksamt Pankow von Berlin 2014)

Abhängigkeit von der Unternehmensart (Restaurant oder nicht). Im zweiten Teil dieser Arbeit beschäftigen wir uns mit verhaltenstheoretischen Hintergründen lebensmittelrechtlicher Verstöße. Im dritten Teil beschreiben wir Untersuchungsdesign, Daten und das Regressionsmodell. Im vierten Teil werden die Faktoren, die Einfluss auf die Compliance haben, in Abhängigkeit von der Unternehmensart beschrieben. Im abschließenden fünften Teil fassen wir unsere Ergebnisse zusammen und diskutieren diese kritisch.

## 2 Theoretischer Hintergrund

### 2.1 Verhaltenstheoretische Hintergründe lebensmittelrechtlicher Verstöße

Verschiedene Forschungsgebiete beschäftigt die Frage, warum Menschen regelkonform oder regelbrüchig agieren. Klärungsversuche kommen aus der Kriminologie, der Psychologie, der Soziologie und der Ökonomie. Als modelltheoretische Grundlage wirtschaftswissenschaftlicher Analysen dient meist das Konzept eines rationalen Nutzenmaximierers, dessen Verhalten ausschließlich auf materiellen (monetär bewerteten) Motiven basiert. Empirische und experimentelle Studien belegen jedoch auch den Einfluss von extrinsischen und intrinsischen immateriellen Determinanten (Frey und Stutzer 2007; Pinstrup-Andersen 2005; Ostrom und Walker 2003; Lösel und Lösel und Bender 2003; Frey 1990) und altruistischen Motiven (Fehr et al. 2001; Fehr und Gächter 1998). Deshalb können immaterielle Präferenzen und die Bindung an soziale Normen als „protektive Faktoren“ wirken. Sie können als Hemmfaktoren fungieren und Unternehmer gegen „ökonomische Versuchungen“ immunisieren (Hirschauer und Scheerer 2014; Stephenson 2006; Coleman 1988).

*“Protective factors are characteristics in individuals and/or their socio-economic environments that discourage actors from rule-breaking by causing nonmaterial benefits (utility) in the case of compliance and non-material costs (disutility) in the case of non-compliance”* (Hirschauer und Scheerer 2014).

### 2.2 Transparenzsysteme

Transparenzsysteme scheinen geeignete Instrumente zu sein, um die Compliance bei Unternehmern zu fördern, da sie beachtliche Erfolge in Bezug auf die Einhaltung der lebensmittelrechtlichen Vorschriften

erzielen (Jin und Leslie 2003; Nielsen 2007; Wong et al. 2015). Ein geeignetes Labeling ermöglicht den Verbrauchern, vor Ort informierte Entscheidungen zu treffen (Fung et al. 2007). Dadurch ergeben sich für die Unternehmer marktbasierende materielle Anreize zur Regelbefolgung, beispielsweise durch Umsatzsteigerung oder Kundenverlust (Hirschauer und Bavorová 2014). Zudem vermutet man auch eine Wirkung auf immaterielle Motivationen, da es z. B. bei nicht-anonymen Nachbarschafts- und Kundenbeziehungen zur sozialen Ausgrenzung des Unternehmens kommen kann, sollten Verstöße gegen geltendes Recht veröffentlicht werden (Munro 2010; Tyler 2006; Kulik et al. 1968).

Die weltweiten Transparenzsysteme unterscheiden sich hinsichtlich ihrer Ausgestaltung und Umsetzung. So wurden beispielsweise in New York und Toronto nur die Ergebnisse der Restaurants (auch Fast-Food-Restaurants, Take Aways u. a.) in die Veröffentlichung einbezogen (Rotondo und Schapiro 2011; New York City Department of Health & Mental Hygiene 2011; City of Toronto Department of Public Health 2012), während das dänische Smiley-System die Gesamtheit aller Lebensmittelunternehmer erfasst (Bavorová und Hirschauer 2012; DVFA 2011).

Vor diesem Hintergrund erscheint es sinnvoll, behördliches Handeln so zu gestalten, dass Verhaltensrisiken durch geeignete Steuerungsinstrumente reduziert werden und eine effektive und kosteneffiziente Prävention erreicht wird. Transparenzsysteme scheinen potenziell geeignete Instrumente zu sein, um das Verhalten der Unternehmer in die gewünschte Richtung zu steuern. Ein derartiges *Verhaltensrisikomanagement* setzt ein gutes Verständnis der wirtschaftlichen Entscheidungssituationen und der Präferenzen der Akteure voraus. In dieser empirischen Studie beziehen wir uns auf den analytischen Rahmen von Hirschauer et al. (2012). Dieser spezifiziert Faktoren, die in einer verhaltensökonomischen Studie betrachtet werden sollten. Dabei wird Verhalten als Funktion der ökonomischen Versuchung zum Gesetzesbruch (materielle Determinanten) in Verbindung mit immateriellen (extrinsischen und intrinsischen) protektiven Faktoren beschrieben.

Unsere Forschungsfragen lauteten daher: Beeinflusst die Veröffentlichung von Kontrollergebnissen die immateriellen extrinsischen und intrinsischen Verhaltensdeterminanten und somit die Compliance? Und wie unterscheidet sich die Wirkung der Veröffentlichung der Kontrollergebnisse in Abhängigkeit der Unternehmensart?

### 3 Daten

#### 3.1 Datengrundlage

Im Frühjahr 2014 führten wir eine schriftliche Befragung unter Lebensmittelunternehmern in den Berliner Bezirken Pankow, Lichtenberg und Marzahn-Hellersdorf durch. Diese Bezirke verfügten über ein kongruentes verpflichtendes Transparenzsystem (Smiley-System) nach dänischem Vorbild. Die Veröffentlichungen zeigen das Ergebnis der behördlichen Kontrolle (mittels vergebener Minuspunkte für vorgefundene Verstöße) und ein Smiley-Piktogramm (Abb. 1).

Von den insgesamt 278 Rückläufern beantworteten 186 die Frage nach den Minuspunkten (Verstößen), in die ökonomische Analyse einbezogen werden. Die untersuchten Betriebe wurden anschließend in die Gruppe der Restaurants (Restaurants, Schnellrestaurants, Bars, Cafés und Schankwirtschaften) oder in die Gruppe der anderen Lebensmittelunternehmen (Bäckereien/Konditoreien, Fleischereien, industrielle Lebensmittelproduktionsbetriebe, Gemeinschaftsverpflegungen, Kindertagesstätten) eingeteilt. Es wurden 101 Restaurants und 85 andere Lebensmittelunternehmen in das Schätzmodell einbezogen werden.

Der verwendete Fragebogen beinhaltete insgesamt 8 Blöcke. Die verwendeten Fragen wurden in Anlehnung an den theoretischen Rahmen der Untersuchung unterteilt in:

- (i) materielle Verhaltensdeterminanten,
- (ii) externe und interne protektive Faktoren und
- (iii) persönliche Angaben und Unternehmenscharakteristika.

Die bei der behördlichen Kontrolle vorgefundenen Verstöße bestimmten die Anzahl der Minuspunkte und machten Regelverstöße mess- und vergleichbar. Die Anzahl der Minuspunkte (als Maß für die Compliance) stellt die abhängige Variable für die ökonomische Analyse dar. Wir verwendeten die folgende Frage als Maß für die Compliance: „Von der Homepage des Lebensmittelüberwachungsamtes Ihres Bezirkes wurde die folgende Einteilung der Minuspunkte bei einer Kontrolle übernommen. Bitte kreuzen Sie an, wie viele Punkte Sie bei der letzten Kontrolle der Lebensmittelüberwachung bekommen haben.“ In unserem ökonomischen Modell betrachteten wir vergleichend den Einfluss von 15 erklärenden Variablen und einem Interaktionsterm auf die Compliance der beiden Gruppen von Lebensmittelunternehmen (Restaurants und anderen

Lebensmittelunternehmen). Die verwendeten erklärenden Variablen sind in Tab. 4 dargestellt.

#### 3.2 Charakteristika der teilnehmenden Unternehmen

Als Maß für die Compliance (und damit unsere abhängige Variable) verwendeten wir die von der Behörde vergebenen Minuspunkte. Diese teilten wir—in Anlehnung an die behördliche Veröffentlichung—in 3 verschiedene Kategorien ein (Tab. 1):

- *compliant* (0–2 behördlich erhaltene Minuspunkte; Gruppe 2 im Modell)
- mäßig *non-compliant* (3–20 behördlich erhaltene Minuspunkte; Gruppe 1 im Modell)
- schwerwiegend *non-compliant* (21–72 behördlich erhaltene Minuspunkte; Gruppe 0 im Modell).

Eine deskriptive Beschreibung der Kontrollvariablen für die Befragungsteilnehmer ist in Tab. 2 dargestellt. Die durchschnittliche Anzahl der Mitarbeiter bei den Unternehmen lag bei 6,6 (Gruppe 2), 11,3 (Gruppe 1) und 8,7 (Gruppe 0). Das Durchschnittsalter der befragten Geschäftsführer bzw. -inhaber betrug 47 Jahre (49,3 in Gruppe 2, 44,8 in Gruppe 1, 48 in Gruppe 0). In Gruppe 2 verfügten 59,6 % über einen höheren Bildungsabschluss, wohingegen dies nur bei 46,3 % in Gruppe 1 und bei 54,7 % in Gruppe 0 der Fall war. Annähernd 85 % aus Gruppe 2 bewerteten ihre Kenntnisse der aktuellen Gesetze als gut oder sehr gut, in Gruppe 1 waren es 81 %, in Gruppe 0 ca. 76 %. Stark unterschiedlich war der Anteil des risikoscheuen Verhaltens zwischen den Gruppen (Gruppe 2: ca. 17 %, Gruppe 1: 6,9 % und 24 % in Gruppe 0).

#### 3.3 Methodenwahl

In unserem Modell wurde die abhängige Variable ordinal skaliert, diese beschreibt 3 Kategorien der Compliance (Tab. 1). Die Effektstärke der erklärenden Variablen auf die Compliance variiert in unserem Modell zwischen diesen Kategorien.<sup>1</sup> Für unsere Analyse verwendeten wir daher ein *Generalized-Ordered-Logit* (sog. „gologit2“), in Anlehnung an Williams (2006 und 2010). Dies wird mit folgender Gleichung beschrieben:

<sup>1</sup> Brand-Tests auf Verletzung der parallel-line-assumption: die Null-Hypothese muss zurückgewiesen werden (Effekt zwischen allen Kategorien gleich); *p* Wert = 0,000 (Hilbe 2009 S. 353ff; Long and Freese 2005).

$$P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X\beta_j)}{1 + \{\exp(\alpha_j + X\beta_j)\}}, \text{ with } j = 1, \dots, M - 1$$

In dem Modell kann Y die Kategorien ( $M = 3$ ) Group 0 = schwerwiegend *non-compliant*; Group 1 = mäßig *non-compliant*; Group 2 = *compliant* annehmen. Daraus ergeben sich 2 Schwellenwerte („Cutpoints“). Sie separieren die 3 möglichen Kategorien der Compliance. Am Cutpoint 1 kontrastierten wir die Unternehmen mit den schwerwiegenden Verstößen gegenüber denjenigen, die sich mäßig *non-compliant* und *compliant* verhielten. Am Cutpoint 2 kontrastierten wir die Gruppen 1 und 0 gegenüber der Gruppe 2 (Liu und Koirala 2012; Hilbe 2009; Windzio 2013; O'Connell 2000; Fu 1998). Das verwendete gologit2-Modell erlaubte es, den Koeffizienten der Variablen (im Falle einer Verletzung der *parallel line assumption*) zwischen den Cutpoints abzuwandeln. Lag keine Verletzung dieser Annahme vor, waren die Koeffizienten identisch.

## 4 Ergebnisse

Die Ergebnisse der Schätzung des Einflusses der erklärenden Variablen (in Abhängigkeit von der Unternehmensart) auf die Compliance sind in Tab. 3 dargestellt. Die materiellen Determinanten und die Charakteristika der Befragten und der Unternehmen werden als Kontrollvariablen in unserem Modell verwendet.

### 4.1 Einflussfaktoren auf die Entscheidung zur Compliance von Restaurants

Bei der Betrachtung der „immateriell extrinsischen Determinanten“ stellten wir fest, dass das Gefühl der Fairness/Angemessenheit der erhaltenen Bewertung bei allen Unternehmen einen signifikant positiven Einfluss auf die Wahrscheinlichkeit von Compliance

hatte. Je fairer ein erhaltenes Smiley empfunden wurde, umso höher war die Wahrscheinlichkeit von Compliance (Tab. 4).

Die weiteren betrachteten Determinanten hatten einen signifikanten Einfluss, wenn man die Compliance in den beiden Gruppen der Verstoßenden verglich. Hier gab es Hinweise, dass sich das Schamgefühl im Falle einer negativen Veröffentlichung positiv auf die Compliance auswirkt. Je stärker das Schamgefühl im Falle einer Veröffentlichung von Verstößen, desto höher die Wahrscheinlichkeit von Compliance. Ferner indizierte unser Schätzmodell, dass je niedriger die Unternehmen einen Rufschaden durch einen negativen Smiley bewerteten, umso niedriger ist auch die Wahrscheinlichkeit von Compliance. Das Gefühl der Fairness/Angemessenheit der erhaltenen Bewertung hatte einen signifikant positiven Einfluss auf alle Unternehmer. Je fairer ein erhaltenes Smiley empfunden wurde, umso höher war die Wahrscheinlichkeit von Compliance.

Betrachtet man die materiellen Determinanten, die als Kontrollvariablen ins Modell einfließen, gab es Hinweise auf folgenden Zusammenhang: Je niedriger die Unternehmen die Kosten für Compliance bewerteten, desto höher war die Wahrscheinlichkeit von Compliance.

### 4.2 Einflussfaktoren auf die Compliance 'bei' anderen Lebensmittelunternehmen

Unter den immateriell extrinsischen Determinanten hatte das Gefühl der Fairness/Angemessenheit des Smileys einen signifikant positiven Einfluss auf die Wahrscheinlichkeit von Compliance. Auch für das produzierende Lebensmittelgewerbe galt: Je gerechter das erhaltene Smiley empfunden wurde, umso höher war die Wahrscheinlichkeit von Compliance. Weiterhin gab es signifikante Auswirkungen vom Grad der Unterstützung der Smileys: Je größer die Unterstützung, umso höher ist die Wahrscheinlichkeit von Compliance.

**Tab. 1** Darstellung der beobachteten Compliance aller teilnehmenden Unternehmen ( $n = 186$ )

Anzahl Minuspunkte lt. Veröffentlichung	Anteil Stichprobe gesamt nach Anzahl Minuspunkten (%)	Anteil „andere Lebensmittelunternehmer“ nach Anzahl Minuspunkten (%)	Anteil „Restaurants“ nach Anzahl Minuspunkten (%)	Zuordnung im ökonomischen Modell	Verbale Bezeichnung der Gruppen im ökonomischen Modell
0 bis 2	28,5	34,1	23,8	Gruppe 2	<i>compliant</i>
3 bis 20	43,0	43,5	42,6	Gruppe 1	mäßig <i>non-compliant</i>
21 bis 38	16,7	15,3	17,8	Gruppe 0	schwerwiegend <i>non-compliant</i>
39 bis 55	7,0	2,4	10,9		
56 bis 72	4,8	4,8	5,0		

**Tab. 2** Beschreibung der Stichprobe (n = 186)

	Gesamte Stichprobe	Gesetzestreu Gruppe 2 <sup>a</sup>	Gesetzesbrüchig	
			Gruppe 1 <sup>b</sup>	Gruppe 0 <sup>c</sup>
<i>Deskriptive Variablen in %</i>				
Restaurants	54,3	45,3	53,8	64,2
Unternehmen mit Verantwortlichen des Managements für die Compliance	72,0	73,6	73,4	70,6
Beantwortende mit einem höheren Bildungsabschluss	52,4	59,6	46,3	54,7
Beantwortende, die ihr Wissen bzgl. der gültigen Gesetze als gut bzw. sehr gut bewerten	80,4	84,6	81,0	75,5
Beantwortende, die eine verpflichtende Veröffentlichung befürworten***	33,6	54,9	30,8	22,6
Beantwortende, die der Aussage zustimmen sich für einen negativen Smiley zu schämen*	73,5	82,0	75,6	72,6
Beantwortende, die der Aussage zustimmen das der Rufschaden schwerer wiegt als eine Geldstrafe	72,0	80,0	70,5	70,6
Beantwortende, die den erhaltenen Smiley als fair bewerten***	58,6	88,6	61,0	36,7
Beantwortende, die die Regelungen des Lebensmittelrechtes als angemessen empfinden***	56,3	69,8	50,63	55,7
Beantwortende mit ungutem Gefühl bei Non-Compliance*	70,4	72,3	64,1	76,9
Beantwortende, die das Risiko der zufälligen Aufdeckung eines. Hygieneverstößes mit mehr als 50 % angeben	80,9	80,8	79,8	77,3
Beantwortende, die den Arbeitszeitaufwand als Hauptgrund für Verstöße angeben	50,7	40,3	53,2	50,9
Beantwortende, die die anfallenden Kosten als Hauptgrund für Verstöße angeben***	22,3	23,1	11,4	34,0
Beantwortende, die sich risikoscheu verhalten weibliche Beantwortende	14,7 42,7	17,0 45,3	6,9 41,8	24,0 32,7
<i>Mittelwert (Standardabweichung)</i>				
Alter der Antwortenden***	46,9 (9,8)	49,3 (10,9)	44,8 (9,0)	48,0 (9,5)
Gesamtzahl der Mitarbeiter	9,1 (17,1)	6,6 (10,2)	11,3 (21,9)	8,7 (13,9)
Gesamtzahl der Vollzeitmitarbeiter	5,3 (14,2)	3,3 (7,3)	6,7 (18,5)	5,2 (12,0)
Gesamtzahl der Teilzeitmitarbeiter	3,9 (6,4)	3,1 (3,8)	4,8 (8,4)	3,5 (4,8)

\* It. Kruskal–Wallis (equality of population)-Test kann die Null-Hypothese (kein signifikanter Unterschied zwischen den Gruppen) mit einem  $p$  Wert  $< 0,1$  abgewiesen werden

\*\*\* It. Kruskal–Wallis (equality of population)Test kann die Null-Hypothese (kein signifikanter Unterschied zwischen den Gruppen) mit einem  $p$  Wert  $< 0,01$  abgewiesen werden

<sup>a</sup> Unternehmen mit 0 bis 2 Minuspunkten auf Grundlage behördlicher Kontrollen werden im ökonomischen Modell als *compliant* bezeichnet (im Modell: Gruppe 2, kodiert mit der Zahl 2)

<sup>b</sup> Unternehmen mit 3 bis 20 Minuspunkten werden als mäßig *non-compliant* bezeichnet (im Modell: Gruppe 1, kodiert mit der Zahl 1)

<sup>c</sup> Unternehmen mit mehr als 20 Minuspunkten werden als schwerwiegend *non-compliant* (Gruppe 0) bezeichnet (im Modell werden diese mit der Zahl 0 kodiert)

Beim Vergleich von Gruppe 0 mit den Gruppen 1 und 2 stellten wir Folgendes fest: Je geringer die Bewertung des persönlichen Rufschadens durch einen negativen Smiley, umso niedriger ist auch die Wahrscheinlichkeit von Compliance. Konträr zu den Restaurants fanden wir hier keinen Hinweis auf einen signifikanten Einfluss von Scham auf die Compliance im Falle einer negativen Veröffentlichung.

Bei den immateriell intrinsischen Determinanten wirkte sich das Gewissen der Probanden signifikant auf die Compliance aus. Die Wahrscheinlichkeit von

Non-Compliance stieg mit einer geringen Ausprägung des sog. „schlechten Gewissens“. Weiterhin fanden wir Hinweise, dass die Akzeptanz von gültigen Gesetzen die Wahrscheinlichkeit von Compliance in den Gruppen 1 und 0 (im Vergleich zu Gruppe 2) signifikant erhöhte.

Bei der Betrachtung der Kontrollvariablen stellten wir fest (analog zur Gruppe der Restaurants): Je niedriger die Kosten 'in Verbindung mit' Compliance eingeschätzt wurden, umso höher war die Wahrscheinlichkeit von Compliance.



**Tab. 3** Ergebnisse der Regressionsanalyse für die abhängige Variable „Compliance“ für die Unternehmensgruppen „Restaurants“ und „andere Lebensmittelunternehmer“<sup>a</sup>

Variablenname (Beschreibung)	Restaurants		Andere Lebensmittelunternehmen	
	Cutpoint 1 Koeffizient (Standardfehler)	Cutpoint 2 Koeffizient (Standardfehler)	Cutpoint 1 Koeffizient (Standardfehler)	Cutpoint 2 Koeffizient (Standardfehler)
<i>Immateriell extrinsische Determinanten</i>				
1) Smiley Unterstützung <sup>e</sup> (Unterstützung von Transparenzsystemen)	0,248 (0,525)	0,248 (0,525)	1,553 (0,820)**	1,553 (0,820)**
2) Scham <sup>d</sup> (im Falle eines negative Smiley)	0,529 (0,464)	3,045 (1,140)***	0,216 (0,648)	0,216 (0,648)
3) Rufschaden <sup>d,e</sup> (verursacht durch einen negativen Smiley)	-0,542 (0,334)	-2,980 (0,931)***	-1,716 (0,891)**	0,661 (0,813)
4) Fairness <sup>d,e</sup> (Bewertung wird als Gerechtfertigt empfunden)	1,357 (0,484)***	6,672 (1,776)***	3,182 (1,172)***	3,182 (1,172)***
<i>Immateriell intrinsische Determinanten</i>				
5) Akzeptanz <sup>d,e</sup> (Gefühl der Angemessenheit der aktuellen Gesetze)	-0,455 (0,405)	1,215 (0,755)	0,004 (0,898)	8,941 (3,303)***
6) Gewissen (schlechtes Gewissen bei Verstößen)	-0,628 (0,432)	-0,628 (0,432)	-1,639 (0,761)**	-1,639 (0,761)**
<i>Materielle Determinanten</i>				
7) Aufdeckungswahrscheinlichkeit (Einschätzung des Aufdeckungsrisikos durch relevante Dritte)	-0,290 (0,421)	-0,290 (0,421)	0,364 (0,606)	0,364 (0,606)
8) Arbeitskosten verbunden mit Gesetzestreue <sup>d</sup> (die mit Compliance verbundene nötige Arbeitszeit ist Hauptgrund für Verstöße)	0,126 (0,774)	-5,886 (1,796)***	-1,709 (1,204)	-1,709 (1,204)
9) Kosten verbunden mit Compliance <sup>d,e</sup> (als Hauptgrund für Verstöße)	-1,951 (0,950)**	-5,730 (2,026)***	-1,833 (1,948)	-7,136 (3,069)**
10) Smiley & Umsatz (ein positive Smiley ist für den Umsatz eines Unternehmens förderlich)	0,005 (0,289)	0,005 (0,289)	-0,684 (0,517)	-0,684 (0,517)
11) Umsatz & Unterstützung <sup>d,e</sup> (Interaktionsterminus bestehend aus „Smiley & Umsatz“ und „Smiley & Unterstützung“)	-1,809 (0,807)**	-1,809 (0,807)**	-4,552 (1,644)***	-4,552 (1,644)***
<i>Charakteristika der Befragten und des Betriebs</i>				
12) Geschlecht (männl. = 0)	2,102 (0,808)***	2,102 (0,808)***	-3,180 (1,411)**	-3,180 (1,411)**
13) Alter <sup>(e)</sup> (in Jahren)	-0,071 (0,044)	-0,071 (0,044)	-0,095 (0,607)	0,992 (0,370)***
14) Ausbildung <sup>(e)</sup> (Dummy-Variable 1 = höherer Bildungsabschluss)	0,360 (0,693)	0,360 (0,693)	-2,088 (1,596)	10,034 (4,110)***
15) Risiko <sup>(e)</sup> (grundsätzliche Risikoeinstellung (0 bis 4 = Risiko-avers)	-0,834 (0,549)	-0,834 (0,549)	-2,635 (1,189)**	1,081 (1,038)
16) Verantwortliche <sup>(e)</sup> (Dummy-Variable 1 = Mitglied des Managements verantwortlich für Compliance)	1,408 (0,831)*	1,408 (0,831)*	-2,231 (1,561)	10,570 (4,013)***
Konstante	6,062 (2,738)**	-19,264 (7,134)***	20,433 (7,644)***	-90,03 (33,028)***

<sup>a</sup> \*  $p$  Wert < 0,1; \*\*  $p$  Wert < 0,05; \*\*\*  $p$  Wert < 0,01

<sup>b</sup> Anzahl der Beobachtungen ist durch Fehlwerte begrenzt auf 74

<sup>c</sup> Likelihood-ratio test ( $p = 0,0000$ ), Pseudo  $R^2 = 0,4710$

<sup>d</sup> Variablen, die die „parallel line assumption“ im Fall Restaurants verletzen

<sup>e</sup> Variablen, die die „parallel line assumption“ im Fall anderer Lebensmittelunternehmen verletzen

## 5 Diskussion

In dieser Arbeit untersuchten wir den Einfluss von materiellen und immateriellen Determinanten auf unternehmerisches Entscheidungsverhalten im Falle der Anwendung von verpflichtenden

Transparenzsystemen. Eine solche Analyse ist vor dem Hintergrund der aktuellen Diskussion um Transparenzsysteme in Deutschland von besonderer Bedeutung. Um deren Wirkung bewerten zu können, führten wir eine empirische Untersuchung unter Lebensmittelunternehmen in Berlin Pankow,

**Tab. 4** Übersicht über die erklärenden Variablen im ökonometrischen Modell

Variablenbezeichnung	Fragentext im Fragebogen	Mögliche Antworten
1) Smiley-Unterstützung	Bitte kreuzen Sie nun nach Ihrer eigenen Erfahrung mit dem Pankower Smiley an, ob Sie die Veröffentlichungen der behördlichen Kontrollergebnisse heute befürworten	0 (nein); 1 (teils/teils); 2 (ja)
2) Scham	Bitte beurteilen Sie die folgende Aussage nach Ihren Erfahrungen: Ein negativer Smiley wäre mir peinlich, ich würde mich dafür schämen	von 0 (stimme voll und ganz zu) bis 4 (stimme nicht zu)
3) Rufschaden	Bitte beurteilen Sie die folgende Aussage nach Ihren Erfahrungen: Die Schädigung des Rufes wiegt schwerer als aktuell verhängten Geldstrafen	Von 0 (stimme voll und ganz zu) bis 4 (stimme nicht zu)
4) Fairness	Die Bewertung die ich erhaltend habe empfinde ich als fair	von 0 (stimme voll und ganz zu) bis 4 (stimme nicht zu)
5) Akzeptanz	Die Regelungen des Lebensmittelrechtes sind angemessen:	von 0 (stimme voll und ganz zu) bis 4 (stimme nicht zu)
6) Gewissen	Bei einem Verstoß habe ich immer ein ungutes Gefühl, auch wenn es niemand erfährt	von 0 (stimme voll und ganz zu) bis 4 (stimme nicht zu)
7) Aufdeckungswahrscheinlichkeit	Wie hoch schätzen Sie das Risiko einer zufälligen Entdeckung eines Hygieneverstößes durch Nachbarn, Kollegen; Passanten etc.?	0 (0 bis 25 %) bis 3 (75 bis 100 %)
8) Arbeitszeit in Verbindung mit Gesetzestreue	Aus Ihrer beruflichen Erfahrung heraus können Sie am besten einschätzen, warum es hauptsächlich zu Verstößen gegen die Hygienebestimmungen kommt. Der Hauptgrund ist die mit der Einhaltung verbundene Zeitmangel	0 (stimme nicht zu) oder 1 (stimme zu)
9) Kosten in Verbindung mit Gesetzestreue	Aus Ihrer beruflichen Erfahrung heraus können Sie am besten einschätzen, warum es hauptsächlich zu Verstößen gegen die Hygienebestimmungen kommt. Der Hauptgrund sind die mit der Einhaltung verbundenen Kosten	0 (stimme nicht zu) oder 1 (stimme zu)
10) Smiley Umsatz	Bewerten Sie bitte die Aussage aus der Literatur aus Ihren Erfahrungen nach 4 Jahren Smiley: Ein lachender Smiley ist für den Umsatz eines Unternehmens förderlich	von 0 (stimme voll und ganz zu) bis 4 (stimme nicht zu)
11) Umsatz & 'Unterstützung**	Interaktionsterm besteht aus den Variablen Smiley-Umsatz und -Unterstützung	
12) Geschlecht	Sind Sie	0 männlich, 1 weiblich
13) Alter	In welchem Jahr wurden Sie geboren?	Jahresangabe
14) Ausbildung (Dummy-Variable)	Verfügen Sie über einen höheren Bildungsabschluss, wie: Meister des Handwerks, Fachschul-, Fachhochschul- bzw. Universitätsabschluss	0 kein höherer Bildungsabschluss 1 höherer Bildungsabschluss
15) Risiko	Wenn Sie Ihre grundsätzliche Risikoeinstellung bei unternehmerischen Entscheidungen beschreiben sollten, in welcher der folgenden Aussagen finden Sie sich am ehesten wieder?	0 (hoch risikofreudig) bis 4 (hoch Risiko-avers)
16) Verantwortlicher (Dummy-Variable)	Wer ist vorwiegend für die Einhaltung der gesetzlichen Bestimmungen in Ihrem Unternehmen zuständig?	1 = jeder Mitarbeiter einzeln 0 = ein Mitglied des Managementboards

\*\* Interaktionsterminus, bestehend aus „Smiley & Umsatz“ und „Smiley-Unterstützung“

Lichtenberg und Marzahn-Hellersdorf durch. Diese Unternehmen sind deutschlandweit die einzigen Unternehmen, deren behördliche Inspektionsergebnisse verpflichtend veröffentlicht wurden. Aufgrund

von Rechtsunsicherheiten wurden diese allerdings im Jahr 2014 eingestellt (Foodwatch 2014).

Unsere Forschungsergebnisse bestätigen den in der Literatur beschriebenen, möglichen Einfluss von

Transparenzsystemen auf das Verhalten der Unternehmer (Jin 2009; Nielsen 2007; Jin und Leslie 2003; Grasmick et al. 1991). Unsere Ergebnisse zeigen, dass Transparenzsysteme einen Einfluss auf die Verhaltensdeterminanten der Unternehmer haben und somit geeignet sind, die Compliance zu fördern. Dieser Einfluss variiert in Abhängigkeit von der Unternehmensart zwischen Restaurants (Dienstleistern) und anderen Lebensmittelunternehmen (Produzenten).

Die einzige Determinante, die das Entscheidungsverhalten aller Probanden gleichermaßen beeinflusste, war die Empfindung von Fairness/Angemessenheit. Je gerechter das erhaltene Smiley empfunden wurde, umso höher war die Wahrscheinlichkeit von Compliance. Die unterschiedlichen Wirkungen der Determinanten zeigten sich zwischen den beiden Gruppen von Unternehmen (Restaurant oder nicht) und ebenso an den Cutpoints. Schamgefühl verbunden mit einem schlechten Smiley wirkte sich bei Restaurants signifikant positiv auf die Compliance aus, wie der Vergleich von Gruppe 2 mit den Gruppen 1 und 0 zeigte. Damit kann Schamgefühl als externer protektiver Faktor angesehen werden, der Restaurants mit beobachtbarer Compliance vor Non-Compliance schützt. Unter den immateriellen Determinanten wirkt bei Unternehmen, die nicht der Gruppe der Restaurants zuzordnen sind, die Akzeptanz der gültigen Gesetze als protektiver Faktor gegen die Non-Compliance. Weiterhin ist der Rufschaden als externer protektiver Faktor bei diesen Unternehmen hervorzuheben: Je geringer der Rufschaden durch einen schlechten Smiley gewertet wurde, umso geringer war die Wahrscheinlichkeit von Compliance.

Auch wenn die Wirkungen des Smileys abhängig von der Unternehmensart variierten, fanden wir einen signifikanten Einfluss verschiedener Determinanten auf die Compliance von Unternehmen. Somit bieten Transparenzsysteme das Potenzial, unternehmerische Verhaltensweisen in eine Verbraucherfreundliche Richtung zu beeinflussen. Eine geeignete Darstellung und ein hoher Bekanntheitsgrad bei den Verbrauchern sind Voraussetzungen für eine erfolgversprechende Einführung von Transparenzsystemen (Sammer und Wüstenhagen 2006; Sranka und Schweitzer 2000). Die Basis von Veröffentlichungen ist eine tragfähige Rechtsgrundlage, die diese Systeme widerspruchsfrei legitimiert (Schönball 2014; Foodwatch 2014). Nur so können konsistente Systeme etabliert werden, die dem Verbraucher informierte Kaufentscheidungen ermöglichen und so einem

Versagen des Marktes auf Grund von Informationsasymmetrien entgegenwirken (Akerlof 1970).

Ein limitierender Faktor unserer Studie war das Übertragen der Wirkungen der einzelnen Determinanten auf das Entscheidungsverhalten des Geschäftsführers bzw. -inhabers auf die Compliance des gesamten Unternehmens. Diese Betrachtung abstrahiert von der Tatsache, dass unternehmerische Entscheidungen das Resultat von multiplen Handlungen im Unternehmen sein können.

Weiterhin bleibt zu diskutieren, ob und wie die Veröffentlichungen auf diversen privaten Internetplattformen im Vergleich zu behördlichen Veröffentlichungen zu bewerten sind. Hier wurden subjektive Erfahrungen einzelner Gäste veröffentlicht. Bedingt durch die weite Verbreitung und Nutzung des Internets erfahren diese Bewertungen immer größere Beliebtheit. Es muss diskutiert werden, inwieweit hier behördliche Veröffentlichungen, die von Amts wegen nach standardisierten Kriterien durchgeführt werden, eine objektive Möglichkeit der informierten Entscheidung für den Verbraucher bieten.

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# **Does Disclosure of Food Inspections Affect Business Compliance? The case of Berlin, Germany**

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## **Abstract**

**Purpose:** A whole series of food scandals indicates that misdirected incentives continue to be a source of food risks. Lacking market transparency and the opportunistic use of seemingly profitable opportunities to break the rules cause negative externalities and the failure of markets. In this work, we investigate the influence of mandatory transparency schemes on food businesses' behavioural drivers and thus on compliance.

**Design/methodology/approach:** We use an adopted analytical framework developed by Hirschauer et al. (2012) as theoretical background. We provide an empirical analysis of the effects of a disclosure system on businesses' behavioural drivers in three urban parts of the German capital Berlin. We conducted a pen and paper survey among food businesses to collect data and used a generalized ordered logit regression model to analyse them.

**Findings:** The results show that the higher the businesses assess the possible negative effects of a negative smiley on sales the higher the probability of compliance. Considering the immaterial behavioural drivers (protective factors) we find statistical significant influence of a feeling of embarrassment in case of disclosure and the feeling of a fair evaluation on compliance. Thus, our study supports the expectation that disclosure policies affect behavioural drivers and have the potential to steer food businesses' compliance.

**Practical implication:** Our study supports the expectation that hygiene controls' disclosure positively affects food businesses' compliance. This finding should be taken into consideration in the ongoing discussion about disclosure. Nowadays, there is no mandatory transparency in Germany due to a strong opposition among businesses and their lobbying groups, and some policy.

## **Keywords**

Food Safety, Compliance, Disclosure, Behavioural drivers, Generalized Ordered Regression Model

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## **1 Introduction**

Regulatory improvements are important in the policy field of consumer protection. A recent series of food scandals indicates that misdirected incentives continue to be a source of food risks. Intransparencies remain in present-day food supply chains which, according to the perception of at least some food businesses, make non-compliance more profitable than compliance (cf., Hennessy et al. 2003; Casey and Lawless 2011). Lacking market transparency and

the opportunistic use of seemingly profitable opportunities to break the rules causes negative externalities and failure in the markets. That is, food producers—be they individual food business operators or large companies—might exploit the fact that neither their production activities nor resulting food properties can be directly observed by customers. Self-interested profit maximising producers may misuse such information asymmetries with the goal to maximise price and maximise the costs of compliance with public and private standards. A regulatory design will only succeed in being “smart” if it is based on a realistic behavioural model in which the relationships between the actors’ behavioural determinants and their behaviour are sufficiently considered (Hirschauer and Bavorová, 2014). Instead of focussing on monetary incentives only, this implies getting the utilities right as they are subjectively expected by multiple-goal decision-makers. Getting utilities right requires that the change of extrinsic motivation and the change of intrinsic motivations are simultaneously accounted for. One could also say that a regulatory design can only be smart if the correlations between the induced change of extrinsic motivation and the induced change of intrinsic motivation are considered adequately. The introduction of a new regulatory approach in consumer policy represents a deliberate change of the actors’ institutional environment. The outcomes of such a change are not certain at the outset. Before new consumer policies are implemented it is essential to assess the behavioural changes that are likely to be caused by the intended institutional change. In this paper, we focus on disclosure because disclosure of inspection results schemes of various designs is increasingly used by food safety authorities to advance the consumer protection goal. Furthermore, well designed disclosure schemes seem to be promising candidates for smart consumer policies because, in a consumer food market that is riddled with information asymmetries, they attack the underlying problem directly. The regulatees’ behavioural determinants can be understood as the expected utilities they subjectively associate with their choices. We employ here a broad utilitarian view to understand regulatees’ behaviour. The utilitarian view understands human behaviour as being shaped by a mixture of motivations including social reputation, altruism and other non-wealth maximizing preferences (cf., North 1990), such as professional ethics. Depending on context, utility gains from complying with rules may (or may not) outweigh temptations to break them (cf., Etienne 2011; Nielsen and Parker 2012; Pinstrup-Andersen 2005).

We use an adopted analytical framework developed by Hirschauer et al. (2012) and then extended by Hirschauer and Scherer (2014) for analysis of the food businesses’ compliance. The framework specifies *what* needs to be studied in a behavioural economic analysis aimed at understanding the mental models and facts as subjectively perceived by the economic actors. In this paper, we concern ourselves with the analysis of the regulatees’ behavioural drivers that are affected by mandatory disclosure policies. We aim to answer the research question:

Does the disclosure of food inspection affect the material and immaterial behavioural drivers and thus compliance?

In doing so, we provide an empirical analysis of the effects of the disclosure system in Berlin on the food businesses’ behavioural drivers and thus on compliance. With the focus on consumer protection, we first describe the new regulatory approach, namely the disclosure of inspection results in food businesses and the analytical framework discussing regulatees’ behavioural determinants (Section 2). Section 3 is concerned with the estimation model and the data. In section 4, we present and discuss the results of the survey. We conclude with Section 5.

## 2 Conceptual theoretical background

### 2.1 Disclosure of inspection results in food businesses

Consumers prefer to buy food from food businesses that are compliant with industry standards. Publishing information of a company's compliance behaviour increases transparency, strengthens the sovereignty of consumers and better enables them to make free and informed choices (Fung et al. 2007; Schoenheit 2004). If this information is successfully conveyed to consumers via effective disclosure policies, non-compliant businesses will face a competitive disadvantage. They will be sanctioned not only by the authorities but also by a loss of market share. Besides economic losses, a loss of reputation may also provoke social sanctioning from "relevant others" such as business associates, regular consumers, neighbours, friends, and relatives. The anticipation that both economic and social sanctions may arise from rule-breaking furthers the motivation to comply. Disclosure policies can thus be understood as regulatory devices that are aimed at increasing the total amount of compliance by consistently complementing state-administered sanctions with market-based sanctions and social sanctions. Over the course of time, social context and pressure may even induce the economic actors to internalize the corresponding norms. Against this background, food authorities in many countries have adopted transparency schemes in the form of "name-and-shame" measures to advance regulatory goals. Name-and-shame measures are co-regulatory public-private regimes that combine *public* inspection with *private* sanctioning via transparent markets (Martinez et al. 2007, Rouvière and Caswell 2012). The schemes that have been put into practice in various countries differ in many variables. While it is known that the precise institutional design of transparency regimes determines whether and to which extent they are smart, there are few comparative studies in this regard in the food sector. In *Denmark*, a government-mandated disclosure scheme was introduced in 2001 (cf., DVFA 2011). Under the Danish system, food businesses are classified via grades from 1 (full compliance) to 5 (serious compliance deficits), each of which is symbolized by an easily comprehensible pictogram (smiley). The full inspection results as well as the smileys must be published on the premises of food businesses. Highlighting its essential characteristic, this information policy has been widely coined "scores-on-doors." Scores-on-doors approaches are convenient for consumers because they reduce their information search costs. In *Germany* a few pilot transparency projects following a scores-on-doors approach were carried out (cf., Bavorová and Hirschauer 2012). Due to legal uncertainties and judgements currently, the only maintained transparency system is the voluntary smiley system of the German federal district, Osnabrück (2014). In the *UK*, since 2005 an increasing number of local food authorities began to introduce various voluntary schemes to publish the results of food inspections. In the meanwhile, a uniform system has been developed and programmatically labelled "Scores on Doors" (Food Standards Agency, 2015). By the year 2013, this system had been adopted by nearly all local food safety authorities. Scores on doors ratings are based on a malus point system and six ratings are distinguished, ranging from 0 (hygiene standards are very poor) to 5 (hygiene standards are very good). While the form of the presentation is uniform throughout the UK, it is, as yet, a voluntary scheme in some regions (England and Northern Ireland) and an obligatory scheme in others (Wales). Since July 2010, the *New York City* Health Department requires restaurants to post "grade cards" visibly within the business premises (cf., New York City Department of Health and Mental Hygiene 2012). These cards show the malus points that the restaurants have received during the public sanitary inspection. Grade A corresponds to a score between 0 and 13, grade B to a score between 14 and 27. Grade C is assigned for more than 28 malus

points. Food inspectors check for compliance in the fields of food handling, food temperature, personal hygiene and vermin control. Each violation of a regulation earns a certain number of malus points. Grading is then based on totalled malus points. Table 1 shows a short comparison of the mentioned transparency schemes which show the results of the hygiene inspections by the food business authorities.

**Table 1: Short comparison of selected transparency schemes**

Design variables	Evaluated transparency schemes			
	Danish Smiley	Pankow-Smiley*	UK Scores on Doors	New York Grade Cards
(1) Conditions of publication	Mandatory	Mandatory	Voluntary in some regions, mandatory in others	Mandatory
(2) Rating	1 (full compliance) - 5 (serious compliance deficits)	1 (full compliance) - 5 (serious compliance deficits)	0 (hygiene standards poor) -5 (hygiene standards very good)	A (full compliance)-C (serious compliance deficits)
(3) Form of presentation	Five smiley types, inspection report	Five smiley types	Sticker with numbers 0 (improvement necessary) -5 (very good)	Grade Cards A-C
(4) Companies targeted	Entire food chain	Entire food chain	Gastronomy, retail	Gastronomy

\*abolished in 2014

The compliance behaviour of the business is displayed for the consumers, thus the schemes address only the compliance of the business and do not include information about the quality of the food (like in a the “Guide Michelin” or others) as long as the food stuff is produced and handled in law-abiding manner. The co-regulatory name-and-shame approach has proven to effectively increase compliance in a number of cases (cf., Fung et al. 2007; Jin and Leslie 2003 and 2009; Nielsen 2007; Spear 2006). This can be attributed to the following reasons:

- (1) *No erosion of the state’s deterrence and incapacitation capacity occurs since public monitoring and the formal sanctioning of offences by the law remain untouched.*
- (2) *Formal (public) sanctioning is consistently supported by market-based (private) sanctioning. Impending sales losses are often a more powerful economic deterrent than public sanctions.*
- (3) *Economic sanctions are intrinsically linked with social sanctions since food business operators suffer a loss of social reputation and even ostracism after disclosure.*
- (4) *Market-based sanctioning is likely to avoid the dysfunctional effects of crowding-out and reactance that are often associated with tightening public controls and sanctions. They are even likely to crowd in intrinsic motivation because food business operators, accustomed to seeing themselves as entrepreneurs in a competitive market environment, accept*



*customer demands regularly as legitimate. They often consider state-administered sanctions, however, as an illegitimate interference with their entrepreneurial freedom.*

Bonroy and Constantatos (2008) argue that welfare improving transparency systems may need to be mandatory in order to have an impact. Voluntary labelling will be avoided by low quality firms since it reduces their profits.

## **2.2 The regulatees' behavioural determinants**

For analytical convenience, many economic analysts and contract theorists abstract from non-material motivations when analysing people's behaviour. However, there are "new" conceptual developments that view people's choices as being motivated by material and immaterial goals (cf. e.g., Arrow, 2000; Pinstrip-Andresen, 2005). Others stress, however, that incomplete contracts, which leave some space for self-interested decisions, may be superior if people are guilt-averse and if fairness and reciprocity constitute part of their utility function. Some researchers include non-material motivations such as fairness and inequity aversion into formal utility modelling (cf. e.g., Bolton and Ockenfels, 2000; Fehr and Schmidt, 1999; Fehr et al., 1998). Others stress that they should be considered in a comprehensive analysis that takes into account not only the material payoffs, but also the non-material costs (disutility) and benefits (utilities) associated with individual choices (cf. e.g., Frey and Stutzer, 2007; Ostrom, 2005). Regarding the utility function, attention is directed towards links between material and non-material motivations, and evidence suggests that more complete contracts may evoke defiance and even reactance (cf., Miron and Brehm, 2006), thus crowding out positive intrinsic motivations (see Frey and Jegen, 2001, for an overview of the crowding-out theory, but also Ostrom and Walker, 2003). The recent literature on law compliance supports the expectation that a mixture of material and immaterial motivations affect business compliance (Etienne, 2011; Nielsen and Parker, 2012). In this paper, we analyze which material and non-material factors influence the compliance behavior in our sample of food businesses based on the framework by Hirschauer et al. (2012). Material benefits from rule-breaking may result from cost savings generated by sub-standard practices regarding environmental, hygienic or occupational safety prescriptions. For example, working time can be saved. The expected sanction depends on two parameters: (i) the sanction level which the actor expects, and (ii) the expected sanctioning (disclosure) probability. The probability of an offence being sanctioned is determined by factors such as the intensity of monitoring by other actors in the supply chain or by public food inspection as well as by the effectiveness of whistle-blower systems. Thus, both incomplete inspection and incomplete tracing increase the relative competitiveness of rule-breaking. Nonmaterial factors associated with social control and internalized norms that encourage compliance in an environment where material factors would favour non-compliance are termed "protective factors" in the law and economics. In this paper, we use the following definition: "Protective factors are characteristics in individuals and/or their socio-economic environments that discourage actors from rule-breaking by causing nonmaterial benefits (utility) in the case of compliance and nonmaterial costs (disutility) in the case of non-compliance." (Hirschauer and Scheerer, 2014). This definition is a useful tool to transcend an all-too narrow rational choice conception with its restrictive assumption of utility hinging exclusively on material wealth. It turns our attention to the fact that the law not only works "as a means for changing relative prices attached to individual actions" (Parisi 2004: 262), but that there are also nonmaterial factors influencing those "prices" for the individual actor. It corresponds with the understanding that people often pursue multiple goals and strive

not only for wealth but also for social recognition and distinction as well as for consistency with their internalized values and identity (Zack 2011; Stringham 2011; Lösel and Bender 2003; Akerlof and Kranton 2005). Depending on the situation, utility gains from complying with rules may, or may not, outweigh temptations to break them (Pinstrup-Andersen 2005). In addition to the factors considered in the framework by Hirschauer et al. (2012) and its extension by Hirschauer and Scherer (2014), we test the effect of knowledge on compliance behaviour as knowledge of the decision makers is cited as a basic requirement for compliant behaviour (cf. Elffers et al. 2003). Its lack may lead to unintentional law-breaking behaviour. While knowledge of the factors that determine behaviour is crucial for an informative positive analysis of the regulatory status quo and the identification of existing compliance problems, it is, from a normative point of view, equally important to understand the motivational changes that are likely to be brought about by regulatory innovations, such as:

- *Regulatory innovation increases both the extrinsic and intrinsic motivation to comply. Such a desirable interdependency has been termed “crowding-in” (cf., e.g., Frey 1997).*
- *Regulatory innovation enhances the extrinsic motivation (e.g., through controls and monetary incentives) but weakens the intrinsic motivation. Such dysfunctional effects have been termed “crowding-out” (cf., e.g., Frey 1997).*
- *Regulatees consider the new regulatory measures to be illegitimate which may generate reactance. That is, non-compliance may become an intrinsic source of utility and the regulatees may even accept economic disadvantages to regain their freedom of action by breaking rules that they deem to be illegitimate.*

Regulators should, consequently, consider the interactions between extrinsic and intrinsic motivations and search for interventions which, at best, generate a crowding-in effect.

### 3 Estimation model and Data

#### 3.1 Estimation model

The nature of the dependent variable dictates the choice of the estimation model. Our dependent variable is an ordinal variable that describes three classes (degrees) of compliance that are not separated by equal differences in malus-points (cf. Table 2).

**Table 2: Compliance behaviour of the food businesses in the sample (N=186)**

Malus points (compliance classification) allocated by the food authority	Coding in the model	Share of businesses
72 to 56	Seriously non-compliant (group 0)	28.5%
55 to 39	Seriously non-compliant (group 0)	
38 to 21	Seriously non-compliant (group 0)	
20 to 3	Modestly non-compliant (group 1)	43.0%
2 to 0	Compliant (group 2)	28.5%

Further the proportional-odds assumption (also called “parallel-line assumption” or “parallel-regression assumption”) is violated as the results of the Wald test by Brant ( $p=0.001$ ) indicate (c.f. Wooldridge 2014, 207ff; Liu and Koirala 2012; Winkelmann and Boes 2010, 185ff; Hilbe 2009, 353ff). Thus, we choose the generalized ordered logit model `gologit2` according

to Williams (2006) for our analyzes which considers the rank order information included in the dependent variable by estimating a coefficient vector for every outcome (Hilbe 2009, 375ff; Winkelmann and Boes 2010, 192; Cameron and Trivedi 2009, 514). According to Williams (2006) the general formulation of this model is as follows:

$$P(Y_i > j) = g(X\beta_j) = \frac{\exp(\alpha_j + X\beta_j)}{1 + \{\exp(\alpha_j + X\beta_j)\}}, \text{ with } j=1, \dots, M-1$$

With  $M=3$  rank orders, the probabilities  $P$  that  $Y$  will take on the values 1, 2 or 3 are described by the following equations:

$$P(Y_i = 1) = 1 - g(X\beta_1)$$

$$P(Y_i = 2) = 1 - g(X\beta_1) - g(X\beta_2)$$

$$P(Y_i = 3) = g(X\beta_2)$$

The model allows the coefficients of the explanatory variables to differ between the thresholds for all variables that violate the parallel-line assumption. For all other variables, the coefficients are identical for all thresholds. Thus, in the model we test how material behavioural drivers and immaterial internal and external factors and knowledge affect the probability of compliance. Thus, compliance is estimated as a function of:

$$\begin{aligned} Prob(\text{compliance}) = & \beta_1(\text{material factors}) + \beta_2(\text{immaterial extrinsic factors}) \\ & + \beta_3(\text{immaterial intrinsic factors}) \\ & + \beta_4(\text{knowledge}) + \beta_5(\text{characteristics}) + \varepsilon \end{aligned}$$

We consider 21 variables and one interaction term as explanatory variables affecting compliance. The variable knowledge consists of 2 reflective items describing the knowledge of the CEO and the employees within the company.

### 3.2 Data

In 2014, we conducted a pen-and-paper survey among food businesses in three urban districts of the German capital, Berlin; namely, Pankow, Lichtenberg and Marzahn-Hellersdorf. The food authorities in these districts were the only ones in Germany that had introduced a mandatory disclosure system (smiley-system) for food businesses at that time. Hence, compliance in terms of malus-points that had been allocated by food inspectors is known. The results of the inspections were published on the authorities' homepages on the Internet, and were displayed in their businesses. The published sheet contained the name and address of the company concerned as well as the detected legal violations. Furthermore, the compliance group the business belongs to according to the inspection's result and a corresponding smiley pictogram are published. In Pankow, the food authority cooperated with the researchers to conduct the survey. The questionnaires were sent by the authority to all registered local food businesses. In Berlin Lichtenberg and Berlin Marzahn-Hellersdorf, there was no such cooperation with the local authorities. We used the addresses from the authorities' official homepage where the businesses and their inspection results (malus-points allocated by food inspection) were published. Thus, in these districts the survey was conducted among all official published food businesses. We used an anonymous pen and paper survey. We attached stamped, self-addressed envelopes for the participants to return the questionnaire.

At the time the survey was conducted, the inspection results of a total of 514 businesses were published in Pankow, 477 in Lichtenberg and 17 in Marzahn-Hellersdorf. In total, we received 186 responses that provided the malus points from the inspections, which is equivalent

to a share of 18.5% of all published businesses. These responses consist of 148 businesses from Pankow (response rate 28.8% of the published businesses), 34 from the district of Lichtenberg (response rate 7.1%), and 4 from Marzahn-Hellersdorf (response rate 23.5%). To verify if the results are comparable among the districts we compare the compliance behaviour of the food businesses in the individual urban districts. In Pankow, approximately 25% of the businesses belong to the compliant group, 42% to the modestly non-compliant group and 30% to the seriously non-compliant group. For Lichtenberg and Marzahn-Hellersdorf, we find similar results. In these districts, approximately 29% of the businesses belong to the compliant group, ca. 49% to the modestly non-compliant group, and ca. 22% to the seriously non-compliant ones. The higher number of respondents in Pankow indicates that the response rate was promoted by the cooperation of the local food authority. The comparison of the answers indicates that the data are comparable. Because all three districts run an equal disclosure scheme, and due to data protection reasons (the number of the published businesses in Marzahn-Hellersdorf was very low), no further distinction was made. We addressed all food businesses that were published on the authorities' homepages; that is, all businesses whose inspection results were disclosed within the mandatory smiley schemes. In our entire sample, 54% of the businesses are restaurants; whereas, the share of restaurants among food businesses in Germany amounts to 45%. According to official inspection statistics, the highest prevalence of infringements is found in the group of restaurants (BMEL 2014). In our sample, the share of restaurants among the responding businesses is 45% in the compliant group, 54% in the modestly non-compliant group and 64% among the seriously non-compliant ones. We hence believe that we can cautiously generalize our results. However, our sample may suffer from respondent socially-desirable biases that means answers which come along with collecting stated preferences similar to the classical attitude behaviour gap in consumer research (Tourangeau and Yan 2007).

The verbalisation of the items used in the questionnaire was inspired by the Table of Eleven scheme (Baldwin, 2012: 236), that was developed and is predominantly used as a tool to estimate business compliance in the Netherlands (Elffers et al. 2003). In total, our survey comprises eight major blocs of questions that can be related to three sections of the theoretical framework: (i) material factors (ii) immaterial extrinsic factors (iii) immaterial intrinsic factors (iv) respondent's and business' characteristics. The self-reported non-compliance presents our dependent variable for the statistical analyses. For the sake of receiving unbiased answers and avoid problems with the respondent's personal understanding of their own compliance behaviour as reported by Yapp and Fairman (2006), we asked the following question to separate law-abiding from deviant businesses: "At the homepage of the Pankow food authority we found the following five categories of malus-points a business may receive. Please mark with a cross how many malus-points did your business receive from the last inspection." In total, 186 respondents answered this question of compliance. The inspection authority expresses the violations detected in form of malus-points. The malus-points categories - adopted from the authorities' homepages and asked in the questionnaire - are presented in the results shown in Table 2. We reduced the five categories to three rank-ordered groups and coded them from 0 to 2 to indicate increasing compliance: a "non-compliant group" (coded 0) with more than 20 malus-points, a "modestly non-compliant group" (coded 1) with 3-20 malus-points, and a "compliant group" (coded 2) with 0-2 malus-points. We allocated the respondents into three groups with unequal malus point ranges. This allowed us to distinguish the socially desired behaviour that the food authorities are commissioned to ensure (=near-complete compliance with 0-2 malus points) from minor infringements without serious nega-

tive outcomes for consumers (3 to 20 malus points) and serious infringements (more than 21 malus points with a serious endangerment to consumers. A helpful side effect of this kind of division is the balanced number of businesses in the three groups. To test the honesty of answers and thus the validity of the survey results, we used the surveys conducted in Lichtenberg and Marzahn-Hellersdorf. Here, we knew the addresses and the inspection results from the official homepage. According to the published malus-points, we encoded the dates of the surveys' covering letter (we used five different covering letters whose only difference was the date which was adapted to the respondent's compliance group that are shown in Table 2). This procedure allows us to compare the published official malus-points of the businesses and the malus-points they indicated in the questionnaire. Thus, this enables us to test the respondents' honesty while ensuring full anonymity as individual respondents cannot be identified just the malus-points they received. We model (rank-ordered) compliance as a function of material factors, immaterial extrinsic factors, immaterial intrinsic factors, respondents' characteristics and knowledge. In the case of reflective variables, we transformed the items according to the Likert item which is essential for a correct scale analysis. The items and scales had been congruently constructed to reflect the hypothesized direction of influence between the exogenous and endogenous variables. The higher (lower) the numerical value the more (less) the respondents agreed with the statement. An overview of all items and constructed variables that are used in the econometric model is given in Appendix 1 Variables used in the econometric model. The material factors are measured via the following variables: impact positive and negative smiley, detection risk and costs of compliance. For the variable "impact positive smiley" 2 reflective items were used that describe the possible material benefits from a positive smiley. For the variable "impact negative smiley" 2 reflective items that describe the possible material losses due to a negative smiley. The variable detection risk consists of 4 reflective items describing the risk of detection by chance and the risk of detection of an infringement by the authorities. Further, the manifest variables costs and labour costs of compliance and a possible increase of the business' profit due to rule breaking behaviour is used. The immaterial external factors are measured via the variables smiley support, fairness, embarrassment and reputation. The immaterial intrinsic factors are measured via the manifest variables acceptance and conscience. The variable knowledge consists of 2 reflective items describing the knowledge of the CEO and the employees within the company. For the used reflective variables, we test the reliability using Cronbach's alpha. The results are presented in Appendix 2. The results (that are Cronbach's alpha ranging from 0.54 to 0.87) show that the reliability of the scales can be rated as adequate (Schmitt, 1996).

#### **4 Results and Discussion**

Out of 278 received questionnaires, 186 answered the question of compliance and are considered in the statistical analyses. The questionnaires were completed by business owners (69.6%), executive directors (14.9%), and department leaders (5.5%). As described, we used the responses from Lichtenberg and Marzahn-Hellersdorf to validate the honesty of the answers. The results of our test show that all 38 respondents (100%) of our control group answered honestly to the question concerning their inspection result. Thus, we presume the given answers are reliable. The condensed results of the descriptive statistical analysis of our sample are shown in Table 3.

**Table 3: Sample description of the respondents from Berlin Pankow, Lichtenberg and Marzahn-Hellersdorf (N=186)**

Descriptive variables	Entire Sample	Compliant		
		Compliant (group 2) <sup>1</sup>	Modestly non-compliant (group 1) <sup>2</sup>	Seriously non-compliant (group 0) <sup>3</sup>
%				
<i>Material factors</i>				
Respondent's assessment of the probability of detection of law violations by chance (via neighbors, peers, passersby etc.) higher than 50%	20.7	19.2	20.25	22.64
Respondent's assessment of labour time as main reason for non-compliance	48.9	40.4	53.1	50.9
Respondent's rejection of the statement that a positive smiley has positive effect on business's sales	19.5	16.0	19.74	20.8
<i>Immaterial extrinsic factors</i>				
Respondent's that are supporters of a mandatory smiley system	33.6	54.9	30.8	22.6
Respondents that say that a negative smiley is embarrassing and we would feel ashamed.	76.5	82	75.6	72.6
Respondents that say that a destroyed reputation is more serious than current fines for violations of the food laws.	73.2	80.0	70.5	70.6
Respondents that assess a lack of knowledge as main reason for non-compliance	21.2	23.1	11.4	34.0
<i>Immaterial intrinsic factors</i>				
Respondents that consider the current food law as appropriate	57.6	69.81	50.63	55.8
Respondents that feel uneasy in case of non-compliance, even if nobody notice it	70.1	72.3	72.2	76.9
<i>Respondents' knowledge</i>				
Respondents with good and	80.4	84.6	81.0	75.5

very good knowledge of the law (own assessment)

*Respondents and business characteristic*

		%		
Restaurants from all businesses	54.3	45.3	53.8	64.2
Respondents that are owner of the business	71.1	62.8	70.5	75.0
Businesses with a higher staff member responsible for compliance	72.0	73.6	73.4	70.6
Businesses holding a private certificate	9.1	7.6	10.0	9.4
Respondents with higher education	52.4	59.6	46.3	54.7
Risk averse participants	14.7	17.0	6.9	24.0
		Mean (St. dev.)		
Age of respondent	46.9 (9.8)	49.3 (10.9)	44.8 (9.0)	48.0 (9.5)
Total number of employees	9.1 (17.1)	6.6 (10.2)	11.3 (21.9)	8.7 (13.9)
Total number of full-time employees	5.3 (14.2)	3.3 (7.3)	6.7 (18.5)	5.2 (12.0)
Total number of part-time employees	3.9 (6.4)	3.1 (3.8)	4.8 (8.4)	3.5 (4.8)

<sup>1</sup>“compliant” businesses (group 2) - inspection results: 0 - 2 malus-points (coded 2 in the gologit2); <sup>2</sup>“non-compliant” businesses (group 1) - inspection results: 3 - 20 malus-points (coded 1 in the gologit2); <sup>3</sup> non-compliant businesses (group 0) - inspection results: > 20 malus-points (coded 0 in the gologit2)

The share of restaurants among the businesses is 54.3% in the entire sample while the share of restaurants within the group of the least compliant businesses (group 0) is 64.2%. The businesses have on average 5.3 full time employees and 3.9-part time employees. According to the definition of enterprises in the EU commission recommendation 2003/361/EC (COMMUNITIES, 2003), the majority of the businesses in our sample (81.6%) are microenterprises as they have in total between 1 and 10 employees. 71.8% of the businesses employ 3 or less full time employees. The average age of the participants is 46.9 years, and more than a half of participants are male (59.8%), among the non-compliant group (0) 67.3% of the respondents are male. In the compliance group (2) nearly 59.6% of the respondents hold a higher educational degree while the share in the non-compliant group 0 is 54.7%. 84.6% of the respondents of the compliance group (2) assess their knowledge of the laws as good or very good; whereas, the share in the seriously non-compliant group (0) is 75.5%. Regarding their business competition environment, most of the businesses compete with 5 or less businesses (57.1%), 27.1% of the whole sample compete with 6 to 10 and 15.8% compete with more than 10 direct business rivals. With the statement “majority of our customers are regular customers” 57.9% of the companies agreed. In Table 4, the results of the generalized ordered logit regression are shown.

**Table 4: Results of the generalized ordered logit estimation**

Dependent variable: compliance (2=compliant; 1=modestly non-compliant; 0=seriously non-compliant)				
	Threshold 1 (seriously non-compliant versus modestly non-complaint & compli- ant businesses)		Threshold 2 (seriously non-complaint & modestly non-complaint versus complaint busi- nesses)	
	Coefficient (Std. Error)		Coefficient (Std. Error)	
<i>Material Factors</i>				
Detection risk	-0.013 (0.131)		-0.013 (0.131)	
Labour costs of compliance (costs of compliance 0, no costs for compliance 1)	-1.090 (0.652)	**	1.322 (0.750)	**
Costs of compliance <sup>(d)</sup> (labour costs of compliance 0, no labour costs for compliance 1)	-1.226 (0.486)	*	-1.226 (0.486)	*
Increase profit (from 0 increase 0 till 25% to 3 increase 75 till 100%)	-0.191 (0.107)	*	-0.191 (0.107)	*
Impact negative smiley (negative impact on sales from 0 disagree completely to 4 fully agree)	0.096 (0.056)	*	0.096 (0.056)	*
Impact positive smiley (positive impact on sales from 0 disagree completely to 4 fully agree)	-0.067 (0.079)		-0.067 (0.079)	
Interaction term (Sales and support)	0.497 (0.257)	*	0.497 (0.257)	*
<i>Immaterial extrinsic factors</i>				
Smiley support (supporter of transparency systems from 0 no support to 4 fully support)	1.262 (0.763)		1.262 (0.763)	
Embarrassment (0 no shame - 4 highly ashamed in case of violations disclosure)	0.802 (0.295)	***	0.802 (0.295)	***
Fairness (the received smiley is fair from 0 disagree completely to 4 fully agree)	1.288 (0.327)	***	1.288 (0.327)	***
Reputation (0 reputation damage does not matter - 4 reputation damage is a serious punishment)	-0.321 (0.241)		-0.321 (0.241)	
<i>Immaterial intrinsic factors</i>				
Acceptance (0 current	-0.508 (0.332)		0.901 (0.462)	*



rules are not adequate - 4 highly adequate) <sup>(d)</sup>				
Conscience (bad conscience in case of violations from 0 disagree completely to 4 fully agree)	-0.473 (0.246)		-0.473 (0.246)	
<hr/>				
<i>Respondents' knowledge</i>				
Knowledge (0 inadequate knowledge of the laws to 5 very good knowledge)	0.157 (0.160)		0.157 (0.160)	
<hr/>				
<i>Respondents' and Business characteristics</i>				
Gender (female=1)	-0.019 (0.513)		-0.019 (0.513)	
Age <sup>(d)</sup>	-0.065 (0.034)	*	0.147 (0.742)	***
Education (higher educational degree=1/no higher degree=0) <sup>(d)</sup>	-0.005 (0.579)		1.889 (0.743)	**
Risk (0 highly risk taking - 4 risk averse)	0.056 (0.315)		0.056 (0.315)	
Company type (1=restaurants/ 0= other food business)	-0.862 (0.499)	*	-0.862 (0.499)	*
Responsibility (Member of the Management=1/ every employee himself=0)	0.525 (0.596)		0.525 (0.596)	
Employees (total number of employees)	-0.026 (0.013)	**	-0.026 (0.013)	**
Competition (total number of competitors in the direct surroundings)	-0.026 (0.029)		-0.026 (0.029)	
<hr/>				
Constant	2.802 (2.466)		-16.299 (4.085)	

(a) \* = p-value < 0.1, \*\* = p-value < 0.05, \*\*\* = p-value < 0.01; (b) Number of observations is restricted to 113 due to missing values; (c) Likelihood-ratio test rejects the null of all coefficients (exclusive the intercept) equal to zero (p=0.000); (d) Variables where the parallel line assumption is violated

The interpretation the coefficients depends on whether the parallel-line assumption is violated or not.<sup>1</sup> If it is violated, the model produces two different coefficients. Thus, the results are similar to a series of binary regression results and can be interpreted in the same way. The first panel contrasts the seriously non-compliant businesses versus the modestly non-compliant businesses and the compliant ones. The second panel contrasts both groups of non-compliant businesses versus the compliant ones. In case the parallel-line-assumption is violated at threshold 1, the coefficient indicates the variable's influence in terms of whether the business belongs to the seriously non-compliant class (0) as opposed to the joint group of modestly non-compliant ones and compliant ones (the joint group consists of class 1 and 2). At threshold 2, the coefficient indicates the variable's influence on whether the business belongs to the joint group of non-compliant businesses (the joint group consists of class 0 and 1)

group opposed to the compliant (group 2) ones. For all variables which do not violate the parallel-line assumption, the model produces the same because the effects are equal over all compliance groups (Williams 2006). The smiley systems in Berlin praise businesses that fulfil the rules that are valid for licensed businesses. The smiley system differentiates the businesses according to the level of compliance based on the results of the hygiene controls. There are five smiley faces. Only the best laughing smiley face provides the reputation of a fully compliant business. All other smiley faces may thus provoke doubts among consumers about the quality provided. Using the five different smileys, the smiley schemes in Berlin rank businesses according to their degree of compliance with food laws. Despite the popular moniker of “name and shame,” smiley schemes make balanced use of both praise and shame elements. The “happiest” smiley conveys the best reputation of belonging to the fully compliant businesses. The “saddest” smiley conveys the bad reputation of belonging to the least compliant businesses. The degree to which the in-between smileys generate praise or shame depends on the distribution of the different smiley categories at a given point in time. If, for example, 90% of businesses are awarded the “happiest” smiley, the “second-happiest” smiley may already unfold a shaming effect. If, on the contrary, only 10% of businesses are awarded the happiest smiley, the second-happiest smiley may still carry an important praising effect.

The assessment concerning *the material behavioural drivers* shows that for all businesses compliance is significantly influenced by the possible negative effects of a sad smiley. According to the theoretical framework, we consider possible costs and benefits of a positive/negative smiley as *material behavioural drivers*. The results indicate that for all businesses compliance is significantly influenced by the possible negative material effects of a sad smiley. We test the effect of a positive and a negative smiley on sales as evaluated by the businesses and find evidence that the higher the businesses evaluate a negative material impact of a negative smiley on sales, the higher the probability of compliance. The business evaluation of positive material effects (benefits) of a positive smiley on sales does not influence the probability of compliance significantly. These results are in line with the loss aversion effect described by cf. Kahneman and Tversky (1979), and Tversky and Kahneman (1992). Loss aversion means that humans suffer more when they fall from a better to a worse situation, than they ever enjoy when they rise from a worse to a better. (Smith, 2010). Thus transparency models have not only the potential to increase the probability of compliance among the non-compliant businesses but also influence –through the effect of loss aversion– the compliant ones. We introduce the interaction term “sales and support” to test if the answers on that question are influenced by a link of the support of transparency systems and the evaluation of the effects of the smiley in our model. The results of the interaction term indicate that the effects of these two variables are inter-linked, and with it that the perception of the respondents differs according to the approval or disapproval of transparency schemes. Compliance causes costs. The assessed costs were introduced in the model because from the economic theory point of view compliant behaviour primary depends of the material behavioural drivers. The current food laws require food businesses to establish a HACCP (Hazard analysis and critical control point) system, i.e., an adequate safety information system to identify and control health hazards along the food production process. To ensure a functioning HACCP system creates costs. First, setting up costs (including labour costs and equipment costs) to introduce a HACCP system, and second, operating costs that are in conjunction with running a HACCP system (because the businesses have to comply with the extensive documentation obligations e.g., temperature records from the raw material to the final product). To reflect the actual costs of compliance experienced by the businesses in the compliance groups,

we asked the businesses to indicate the main reasons for non-compliance according to their actual professional experiences. Thus, we asked the businesses to indicate the main reasons for non-compliance according to their current professional experiences (a detailed description of the variables is shown in Appendix 1 Variables used in the econometric model). These costs are operationalized in our model as (a) labour costs (labour time) and (b) costs of compliance (include costs for materials and operating costs within the business). When we examine the influence of labour costs we find differences between the compliance groups. At threshold 1 we find evidence that businesses who evaluate these costs as low have a higher probability of compliance. At threshold 2 we find evidence that businesses who evaluate labour costs as high have a higher probability of compliance. Out of criminology research this result is counterintuitive at the first glance. However, because we find this effect only at threshold 2, we assume that businesses that already demonstrate behavioural compliance are aware how much labour time is required to ensure legal compliance. Thus, we reason that the more businesses are willing to invest in labour time the higher the probability of compliance. Further, we asked the businesses to assess how much their profit could increase in the case of non-compliant behaviour. A low increase of the possible profits connected with rule breaking behaviour promotes the probability of compliance.

Regarding *immaterial external factors*, we find a significant influence of the feeling of embarrassment on compliance: the higher the feeling of embarrassment in the case of disclosure, the higher the probability of compliance. This finding is in line with Braithwaite's reintegrative shaming approach (1989), which focuses on the powerful influence of embarrassment in punishment. Further estimation results indicate that businesses that are believed to have received a fair smiley show a higher probability of compliance. Thus, our findings provide evidence that, among the external protective factors, both the feeling of embarrassment and the feeling of fairness have the potential to increase the probability of compliance.

Among the *immaterial intrinsic factors*, we find a significant influence of the acceptance of the current food laws on compliance when we compare the compliant with (both groups of) the non-compliant businesses. At threshold 2, we find evidence that the higher the internal acceptance of the respondents of the current laws, the higher the probability of compliance. Thus, we can support the findings by cf., Tyler (2006) that a lack of adequate correspondence between regulator and regulatees may generate reactance. In such a situation, non-compliance may become an intrinsic source of utility, and the regulatees may even accept economic disadvantages to regain their freedom of action by breaking rules that they deem to be illegitimate. Regarding the *respondents' characteristics* used as control variables, we find a significant effect of the company type (do the businesses belong to the group of restaurants or not) on compliance. This result conforms with national statistics which provides evidence that the offence rate is significantly higher among restaurants compared to other food businesses along the food supply chain (BMEL 2014). The effects of the variable education show that a higher education of the respondents promotes compliance, when we compare the compliant businesses with the non-compliant ones. Furthermore, we find effects of the age of the respondents on compliance. Further, we find a significant effect of the number of employees on compliance. In our model we find evidence that the lower the number of employees the higher the probability of compliance. This finding is contrary to the findings by cf., Hensen and Heasman (1998) who find that large firms are more compliant, and small firms more likely choose non-compliance as a reaction to new regulatory measures.

## 5 Conclusions

Publishing information on a company's compliance behaviour increases transparency and better enables consumers to make informed choices. If disclosure policies are effective, less-compliant or non-compliant businesses will face a competitive disadvantage. They will be sanctioned by a loss of market share. Besides economic losses, a transparency of non-compliant behaviour may also provoke social sanctioning from "relevant others" such as business associates, regular customers, neighbours, friends, and relatives. The expectation that both economic and social sanctions may arise from rule-breaking fosters the motivation to comply. The costs of the different transparency systems are relatively low as the regular inspection costs, representing the bulk of the costs, are caused anyhow, independent of whether a transparency scheme is established or not. The task of sanctioning is partly "outsourced" to the market and the social community. However, the cost-efficiency is determined by the precise institutional design that differs among the transparency systems. The behavioural risk management perspective based on an adequate model of behaviour provides an integrative language for an interdisciplinary search for better institutional solutions.

In this paper, we concern ourselves with the question of whether the smiley affects the material and immaterial behavioural drivers and thus compliance. The understanding of these effects may be valuable especially for the assessment of the effectiveness of disclosure in preventing non-compliance in food businesses. We conducted an empirical analysis in Berlin and used a generalized ordered logit regression model to analyse the data. Regarding material behavioural drivers, our results provide evidence that smiley faces influence material drivers and thus compliance behaviour. The higher the businesses assess the possible effects of a negative smiley on sales the higher the probability of compliance. Considering the external and internal immaterial behavioural drivers we find strong influence of a feeling of embarrassment in the case of disclosure and the feeling of a fair evaluation (via the smiley) on compliant behaviour.

Thus, we find evidence that besides material behavioural drivers external and internal behavioural drivers have the potential to influence the probability of compliance. A limitation of our study may be that we measured the behavioural motivation of only one decision maker, and analyzed the influence of her/his motivation drivers on the compliance of the whole business. This implies that we abstracted from the fact that some decisions are made individually, e.g. by workers. Nevertheless our study supports the expectation that the hygiene controls' disclosure and transparency measures affect behavioural drivers and may thus positively affect food businesses' compliance. It needs to be taken into consideration that despite the explained positive effects of such schemes disclosure may have some detrimental effects for the food businesses concerned. That may be that the inspection authorities cannot completely control the result of their publication policy. On the one hand, sensation-seeking media may present the disclosed information in such a manner that it may cause disproportionate damage to the business concerned (van Erp 2007). Other businesses might even lack the professional capacity to comply with regulations. In such cases, disclosure without support may lead to a demoralization and defiance (van Erp 2007). Further, the disclosure of non-compliant behaviour may cause economic losses that are a more severe punishment than possible fines. Because the violation was "only" detected and disclosed by an authority and not by a court of law it may violate the presumption of innocence and the principle of proportionality unless "due care has been exercised, a compelling reason for publication is available, *audi et alteram partem* is observed, [and] the company is given the opportunity to react in advance (van der Meulen 2007: 277)." To be judicially feasible, disclosure is subject to strict requirements re-

garding the reliability and objectivity of inspection standards. Furthermore, formal hearings may be a procedural precondition for the adoption of disclosure schemes from a legal point of view. Thus, we can assume that disclosure schemes can only be applied successfully if they are legally viable within a nation's legal and constitutional environment. Further problems may arise regarding the inspection authorities and their food inspectors: The inspection authority can be accused of arbitrariness and unfairness, since it experiences more power by the publication policy (van Erp, 2007; Ho, 2012; Craswell, 2013). In addition, the publication of the inspection results can provoke a hostile reaction from the inspected companies' vis-a-vis the supervisory authority, potentially up to aggressive physical force. The Danish and New York inspectors had these experiences after the introduction of the publication system of food inspection results (Nielsen, 2008; Ho, 2012). Some aspects that improve the fairness of the system were mentioned in the literature: As the publication of inspection results represents only a moment in time and that the results which were collected during a longer time period describe the real conditions more accurately (Caswell, 2013, Ho, 2012;). Thus, the publication of the results of several inspections contributes to the objectivity of the system. The aim of transparency is to promote compliance with regulations and thus increase food safety. The business should be punished for failure but should not be stigmatised. The stigmatic character of disclosure differs in accordance to the disclosure regime. The stigmatic character is influenced by the degree of detail published, by the occasion of disclosure, by the publication scope and used tone and style and by the accessibility of the information for the user (van Erp, 2007). According to Braithwaite's theories of reintegrative shaming, a proper transparency scheme must include the possibility of reintegration. Thus, the company should get the opportunity for a new inspection in a short period of time at its own expense. Re-inspection has a negative impact for the inspectors who need to spend their time re-inspecting the lower rated businesses (Ho, 2012). All of these arguments need to be taken into consideration also in the ongoing discussion of disclosure of hygiene inspection results in Germany. Nowadays, strong opposition among businesses and their lobbying groups, food inspection officers, and some policy makers persists in Germany. In further research, the reasons for rejection of the system should be investigated and measures that have the potential to improve the disclosure system should be suggested (e.g. modified designs of disclosure schemes). Furthermore, the inspectors' expert views regarding the factors and regulatory measures (including disclosure schemes) that promote business compliance could bring new and valuable results.

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## 7 Appendices

### Appendix 1 Variables used in the econometric model

Variable Name	Item	Question type *	Question text	List of answers
Detection risk	Detection risk by chance	MCo	How probable do you think it is that a violation of the hygiene laws will be discovered by chance (via neighbors, peers, passersby etc.)	0 (detection probability 0 till 25%) to 3 (detection probability 75 till 100%)
	Detection risk inspection		How probable do you think it is that a violation of the hygiene laws will be discovered via an inspection of the authorities	0 (detection probability 0 till 25%) to 3 (detection probability 75 till 100%)
	Detection risk whilst inspection		How probable do you think it is that a violation of the hygiene laws will be discovered during an inspection of the authorities	0 (detection probability 0 till 25%) to 3 (detection probability 75 till 100%)
	Detection probability		The detection probability of violations in general is lower than 50%.	0 I disagree completely to 4 I agree completely
Reasons in-fringements	Labour costs of compliance Costs of compliance	MCT	According to your professional experience, please indicate the main reasons of hygiene laws violations. Please mark the two main reasons with a cross: (answers are coded with 1 in case the business indicated an answer	1 inattention, 2 lack of time, 3 lack of knowledge, 4 high costs, 5 lack of interest



			as main reason, and with 0 in case not).	
Impact negative smiley	Smiley customers	MCo	The absence of customers due to a negative smiley causes disproportionate disadvantages for the business owners.	0 I disagree completely to 4 I agree completely
	Smiley ruin		A negative smiley may cause the ruin of a business	0 I disagree completely to 4 I agree completely
Impact positive smiley	Customers awareness of a positive smiley	MCo	The customers are aware of the smiley and buy targeted at compliant businesses	0 I disagree completely to 4 I agree completely
	Positive Sales		A positive smiley promotes business sales	0 I disagree completely to 4 I agree completely
Interaction term	Sales and support**	It	Interaction term consists of the variables smiley sales and smiley supporter	
	Smiley more customer		The customers are aware of the smiley and make targeted purchase decisions	0 I disagree completely to 4 I agree completely
Smiley support	Smiley support	MCo	After your experiences with the smiley system do you support the introduction of a mandatory transparency system?	0 No, 1 Undecided, 2 Yes
Embarrassment	Shame disclosure	MCo	A negative smiley would be embarrassing for me, I would feel ashamed:	0 I disagree completely to 4 I agree completely
Reputation	Reputation damage	MCo	A destroyed reputation is more serious damage than current fines in case of violations:	0 I disagree completely to 4 I agree completely
Fairness	Received smiley fair		The smiley evaluation I received by the authority is fair.	0 I disagree completely to 4 I agree completely
Acceptance	Acceptability of rules	MCo	I consider the current food law as appropriate:	0 I disagree completely to 4 I agree completely
Conscience	Conscience	MCo	I feel uneasy in case of a violation, even in nobody notice it:	0 I disagree completely to 4 I agree completely
Gender	Female	MCo	Gender:	0 male, 1 female
Age	Year	OP	Your year of birth:	
Education	Education (dummy variable)	MCo	Which is your highest completed education:	0 lower education (no graduation, secondary graduation, assistant) 1 higher education (master craftsman, bachelor degree or equal)
Knowledge	Knowledge	MCo	Your knowledge of the current	1 insufficient to 5 very

	CEO		applicable food laws is:	good
	Knowledge CEO	MCo	Your knowledge of the current applicable food laws is:	1 insufficient to 5 very good
Risk	Risk attitude	MCo	Please evaluate your risk attitude in businesses decisions:	0 highly willing to take risks to 4 highly risk avers
Company type	Company type (dummy variable)	MCo	Type of enterprise:	1 restaurant (include fast food restaurant, cafe, bar or tavern) 0 all other types of food companies (bakeries, butchers, retailers, mass caterers, production businesses, kindergardens)
Responsibility	Person responsible (dummy variable)	MCo	Who is responsible for compliance in your company?	1 every employee himself 0 a higher staff level member of the company (i.e. quality manager, division manager, general manager)
Employees	Number employees	OP	How many people are employed in your business (part time + full time employees)?	Total number
Competition	Business competitors	OP	Please try to estimate the number of businesses in your direct surroundings that are in competition to your business.	Total number
Increase profit	Profit increase due to violations	MCo	Please measure how much your profit would increase in case of non-compliant behaviour	0 (increase 0 till 25%) to 3 (increase 75 till 100%)

\*MCo: multiple choice, one answer; MCt: multiple choice, two answers; OP: open question

\*\* Interaction term

## Appendix 2 Reliability of the used scale variables

Variable name	Average inter-item covariance	Number of items in the scale	Scale reliability coefficient
Impact positive smiley	1.092	2	0.866
Impact negative smiley	0.510	2	0.677
Knowledge	0.641	2	0.838
Detection risk	0.226	4	0.542

# Adoption of Agri-Environmental Measures by Organic Farmers: The Role of Interpersonal Communication

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**ABSTRACT Purpose:** *The purpose of this study is to investigate the impact of interpersonal communication on the adoption of agri-environmental measures (AEM) by organic farmers in Germany.*

**Methodology:** *The study used the logit model to predict the probability of adoption behaviour, and Social Network Analysis (SNA) was conducted to analyse the question of whether validating information about organic farming provided by interpersonal information sources is associated with communication frequency.*

**Findings:** *Our findings demonstrate that being an early adopter of organic farming practices and frequent contact with young and highly educated farmers increases the probability of adoption of other AEM. However, contact frequency in interpersonal networks was found not to be a significant determinant for explaining adoption decisions. Frequently communicating farmers in the network are more likely to attribute higher levels of importance to organic farming information received from formal actors than to information received from informal actors.*

**Practical Implications:** *If young and highly educated farmers, who can be considered as informal opinion leaders, are approached by the extension services, then an effective diffusion of information on AEM can be expected. To support the AEM adoption, a platform should be provided by state agencies that would enable organic farmers to understand the environmental benefits achieved over the time.*

**Originality/value:** *This study contributes to the scientific discussion on the role of interpersonal communication on AEM adoption. A new aspect is our consideration of organic farmers adopting additional AEM. Moreover, we highlight organic farmers' validation of the importance of formal and informal information sources on organic farming.*

**KEY WORDS:** Communication frequency, Interpersonal network, Innovation adoption, Agri-Environmental measures, Organic farmers

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## **Introduction and Definitions**

The Council of Agriculture Ministry of the European Union (EU) adopted the most radical reform of the Common Agricultural Policy (CAP) in its history in June 1992 with the McSharry Plan. Overall, the reform entailed an agenda for the redirection of member states' farm policies. An important policy innovation in the new CAP was the implementation of Agri-Environmental Measures (AEM). These schemes became a key instrument of European agricultural and rural policy to reinforce environmentally friendly farming practices and the protection of the countryside. Agri-Environmental (AE) support is paid annually to farmers who volunteer to participate in AEM that extend beyond standard good farming practices and are deemed to be environmentally beneficial (Article 248(4) of the EC Treaty).

The policy will only achieve its intended environmental effect of protecting the European countryside if a critical mass of farmers decides to implement the AEM. The participation rate of farmers in voluntary AE programmes, however, varies considerably within the EU; in some countries, it is rather low. One reason for this may be the different levels of payment among the EU member states. Average public expenditures for organic support payments under the AEM per certified organic hectare, for example, varied between EUR 7 and EUR 314 in the EU 27 (excluding Ireland, Romania and the UK) for the period 2008 to 2009. Average public payments for organic support under AEM per certified organic hectare ranged from EUR 150 to EUR 300 in Germany, France, Greece and Italy, whereas in Belgium, the Czech Republic and Denmark, the amount was less than EUR 150 (Schmidtner et al. 2011, based on EUROSTAT data). However, as various studies on the adoption of AEM have noted (Padel, Lampkin, and Foster 1999; Morris 2000; Falconer 2000), high payment rates alone do not explain the adoption decision. To successfully tackle the problem of AEM implementation, the policy design must consider a plethora of farmers' behaviour drivers in adopting new measures.

In the previous studies on environmental conservation practices, adopting organic farming practices (Padel 2001; Genius, Pantzios, and Tzouvelekas 2006), participating in land-care groups that aim to develop sustainable farming systems (Black and Reeve 1993) and adopting AEM (Deffuant 2001) are considered innovative activities for farmers. In the research field of innovation adoption, an increasing number of studies have recognized the importance of social networks – and particularly the influence of interpersonal communication channels—on farmers' behaviour (Conley and Udry 2001; Bandiera and Rasul 2006; Matuschke and Qaim 2009; Hartwich, Fromm, and Romero 2010). The main studies in this area have highlighted the importance of interpersonal networks in information support.

We understand the term interpersonal communication as the 'process of message transaction or transmission between people to create and sustain shared meaning' (West and Turner 2004, 10) that occurs contemporaneously with synchronous exchange between the communicating parties. The parties interact not only at the same time but also in the same place (Leeuwis 2004, 196). Communication can take the form of bilateral communication, group meetings, and discussions (Leeuwis 2004, 196).

Based on the literature on communication roles and information exchange patterns, we distinguish between formal and informal communication structures (Allen 1977). While a formal communication structure is formulated within the structure, channels and rules of

an organization, an informal communication structure works within social affiliations (Kilduff and Brass 2001).

Compared to conventional farmers, organic farmers have more specific interpersonal network structures and evaluate information sources differently (Burton, Rigby, and Young 1997; Wynen 1990; Lloyd Morgan 2011). Studies show that organic farmers have the same characteristics as typical innovators, i.e., even across long distances, they have strong ties to their interpersonal networks (Rogers 2003). Furthermore, organic farmers build relatively closed networks that are difficult for newcomers to enter (Padel 2001).

We consider organic farmers as those farmers who are previously experienced with AEM because they already practice environmental management standards for organic agriculture. In earlier studies, previous experience is considered to be a determinant that explains adoption of additional AEM. However, these studies show ambiguous results that vary according to the region studied and the type of measure(s) previously adopted. Defrancesco et al. (2008) show that farmers' previous experience in environmental practices is a significant determinant of their participation in additional AEM. Vanslebrouck, Van Huylenbroeck, and Verbeke (2002) analyse the interest of Belgian farmers in two AEM measures: plantation in yard (PIY) and extensification of field margins (EFM). Although previous experiences have a significant influence on the participation in EFM, the results show that previous experience is not significant factor in explaining the participation in PIY. Furthermore, Wynn, Crabtree, and Potts (2001) find previous experience to have a positive significant impact on the speed of adoption of additional AEM.

The main aim of this study is to contribute to the understanding of how interpersonal communication influences organic farmers' adoption behaviour regarding additional AEM. The presented study uses survey information on organic farmers (both AEM adopters and non-adopters) to analyse interpersonal network (formal and informal) characteristics associated with adoption behaviour. First, we use the logit model to predict the probability of adoption behaviour. Second, Social Network Analysis (SNA) is conducted to analyse the question of whether the validation of information about organic farming provided by interpersonal information sources is associated with communication frequency.

The paper is organized into six sections. In the following section, we develop the research framework on the role of interpersonal networks in adoption behaviour and the influence of interpersonal ties for the validation of interpersonal information. Detailed information about the studied data set is provided in the third section. Sections four and five describe the methods applied (logit model and SNA) and the results with discussion, respectively. Conclusions are drawn in the last section.

## **Related Literature and Hypotheses**

### *Adoption Behaviour*

AEM adoption is a complex decision-making process. Previous studies show that many factors influence adoption behaviour for environmental farming practices, including the following: the characteristics of a farm and farmers (Crabtree, Chalmers, and Barron 1998; Wynn, Crabtree, and Potts 2001); attitudes and perceptions towards conservation practices (Black and Reeve 1993; Defrancesco et al. 2008; Vanslebrouck, Van Huylenbroeck, and Verbeke 2002); financial factors (Morris and Potter 1995; Wilson

and Hart 2000; Ducos, Dupraz, and Bonnieux 2009; Sutherland et al. 2012); the institutional design and requirements of policy measures (Polman and Slangen 2008; Dupraz, Latouche, and Turpin 2009; Fraser 2011); and information actors (Lowe and Cox 1990; Morris and Potter 1995; Warriner and Moul 1992; Skerrat 1998).

#### *Are Agri-Environmental Practices an Innovation?*

The definition of innovation used in this research is based on the ‘Guidelines for Collecting and Interpreting Innovation Data’ of the European Community Survey (OECD 2005, 46), where innovation is defined as follows: ‘An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new to the firm’ (EU SCAR 2012). Thus, in this study AEMs are accepted as an innovation as they are new for the farmer. Rogers (2003) distinguishes between ‘hardware’ and ‘software’ innovation. While ‘hardware’ points out the necessary technology, ‘software’ stands for information on how to use technology and how to evaluate its impact. Using this classification, Padel’s (2001) study accepts organic farming as a ‘software’ innovation where farming practices requires new management skills to achieve the regulations. According to Padel (2001), the presented study understands AEM as a ‘software’ based innovation.

In the literature, a variety of theories are used to explain the adoption of AEM, including the theory of reasoned action, principal agent theory, contract theory, innovation adoption theory, etc. The prior literature has articulated certain concerns about using innovation adoption theory to explain the process of conversion to environmental farming practices (Pampel and Van Es 1977; Röling 1993). However, a number of studies disagree with these concerns and consider the adoption of environmental farming practices within the concept of innovation adoption (Black and Reeve 1993; Deffuant 2001; Genius, Pantzios, and Tzouvelekas 2006; Morris and Potter 1995; Padel 2001). While Morris and Potter (1995) use the diffusion of innovation theory to understand the farmers’ willingness to participate in the Countryside Stewardship Scheme in the UK, Deffuant (2001) uses the adoption diffusion theory as a framework for understanding the role of others in the adoption of AEM. Deffuant (2001) considers the innovation adoption theory as a relevant framework for research on adopting AEM based on the definition by Valente (1995), who defines diffusion of innovation as the ‘spread of new ideas, opinions, or products throughout a society, thus diffusion is a communication process in which an adopter persuades those who have not yet adopted to adopt’. Based on previous studies that apply theories of innovation adoption to providing recommendations for adopting environmental practices this study uses an innovation adoption model as a framework for organic farmers’ adoption of AEM.

#### *Interpersonal Communication*

The study by Ryan and Gross (1943) is generally accepted as the beginning of research on innovation diffusion in rural areas; their study describes ‘diffusion’ as a process that aims to reduce uncertainty among potential users. According to Rogers (2003), innovation

adoption begins with sharing information with potential users through two main channels: the mass media and interpersonal communication.

Academic research into interpersonal communication began in the early 1950s with Barnes (1954). The main aim of subsequent studies has been to analyse how relationships between actors influence their behaviour. The concept of the interpersonal network was broadly applied in studies on innovation diffusion. Indeed, a number of studies were published that analysed who influences whom within the community on innovation adoption (Rogers and Beal 1958; Valente and Rogers 1995; Nutley, Davies, and Walter 2002; Albronda, Langen, and Huizing 2011). Sociological research shows that other farmers' opinions and institutionalized sources are an important interpersonal source in farmers' decision-making (for a literature review, see Buttel, Larson, and Gillespie 1990).

A number of studies stress the importance of repeated collaboration and contact frequency between network actors in increasing innovativeness (Lewicki and Bunker 1996; Harhoff et al. 1999; Paruchuri 2010; Chassagnon and Audran 2011). Regarding research on rural areas, Ryan and Gross (1943) find that wide social contact is positively related to farmers' innovativeness and technology adoption behaviour. More recently, Monge, Hartwich, and Halgin (2008) indicate that farmers who have frequent conversations about technological changes in their network are more likely to adopt new knowledge and technology compared to other farmers. In the adoption of agricultural conservation practices, Warriner and Moul (1992) show that connectedness (number of interpersonal sources) has a positive influence on adoption behaviour.

To clarify the importance of contact in interpersonal networks using frameworks other than the network approach, studies on social capital investigate factors that influence farmers' decisions (Morris and Potter 1995; Potter and Gasson 1998; Wilson and Hart 2000). In the social capital literature, participation frequency in agricultural organizations is an important variable that indicates a higher level of social capital (Beugelsdijk 2003; Sobels, Curtis, and Lockie 2001). Social capital is assumed to lower transaction costs and influence farmers' behaviour (Polman and Slangen 2008). Research on innovation diffusion in rural areas has shown that farmers' participation in organizations is an important determining factor in the adoption of different types of innovations (Jagger and Pender 2003). In Belgium, for example, Mathij (2003) finds that AEM adopters consult external sources—such as professional publications or private contacts—more frequently than non-adopters and are more likely to attend association meetings. Despite these positive effects of organizational participation, the aim of organizations and the type of innovation can also influence the results. Research by Drake, Bergström, and Svedsäter (1999) finds that education gained in agricultural schools has a significant negative impact on participation in the Countryside Stewardship Scheme because these schools emphasize the production function of farming practices. In another study, Polman and Slangen (2008) finds that participation in social organizations has a positive effect and participation in agricultural organizations has a negative effect on the adoption of AEM.

The aim of this article is to investigate whether contact frequency in interpersonal networks increases the innovativeness of organic farmers, which is expressed by adopting additional voluntary AEM. Within given conceptual approaches, we consider the formal (agricultural organizations and farmers' associations) and informal (other farmers) dimensions of interpersonal networks. Study observes contact frequency in two ways. First, we consider contact frequency in informal networks via communication with other

farmers. Second, we consider contact frequency within formal networks as participation frequency in agricultural organizations' events.

Thus, we test the following hypotheses:

H1a (informal network): The higher the communication frequency with other farmers on agricultural issues, the higher the probability of organic farmers adopting additional AEM.

H1b (formal network): The higher the participation frequency in agricultural organizations, the higher the probability of organic farmers adopting additional AEM.

Studies on the role of communication in innovation adoption suggest that after farmers become aware of new ideas and/or technologies, they next develop an attitude (whether negative or positive) towards those ideas and technologies (Ambastha 1986; Case 1992). These attitudes are influenced by the characteristics of farmers in regular communication (informal network).

In the AEM adoption research area, the study by DeFrancesco et al. (2008) shows the significant influence of neighbourhood farmers' attitudes on the adoption of AEM, not only for passive adopters (those who adopt AEM mainly for financial reasons), but also for active adopters (those who adopt AEM for both environmental protection and financial reasons).

Research on the characteristics of innovation promoters notes that innovation promoters are characterized by high status (such as education level or employment status) and important roles in innovation adoption behaviour (Kautz and Larsen 2000; Rogers 2003; Nutley, Davies, and Walter 2002; Guerin 2001).

In this study, therefore, we test the following hypotheses:

H2: The higher the education of regularly communicating farmers, the higher the probability of others adopting additional AEM.

H3: The higher the innovativeness of regularly communicating farmers, the higher the probability of others adopting additional AEM.

### *Interpersonal Ties*

In adoption behaviour research, which recognizes the influence of communication frequency in interpersonal networks, relational aspects of the network structure also become an integral part of understanding the relationship between communication frequency and the importance of information sources. The social network analysis (SNA) allows the use of a number of analytical tools to measure the relational aspects of social structure. In our study, we focus on the interpersonal ties that allow information flow on AEM in the communication network.

Previous studies in rural sociology recognize the importance of social structure in information networks for farmers' innovation adoption behaviour (Van den Ban 1970; Warriner and Moul 1992). In particular, these studies show that farmers' adoption behaviour is affected by several structural dimensions of the interpersonal communication network. Rogers (2003) distinguishes the following three main aspects: (1) diversity of the communication network, which refers to network actors' characteristics, such as attitudes and social status; (2) integration in the communication network, which refers to



how well communication occurs with other actors in the network; and (3) connectedness in the network, which refers to the degree to which the focal network actor (ego) is linked to others. Interpersonal ties carry information and connect network actors.

Two types of ties are distinguished in the theoretical studies: weak ties and strong ties (Granovetter 1973). Weak ties maintain greater variety of information flow between network actors; strong ties increase the probability of information flow. Granovetter (1973) introduces several dimensions of tie strength, such as amount of time, intimacy, intensity, and reciprocal services. Tie strength research based on Granovetter's theory uses different proxies of strength, such as communication reciprocity (Friedkin 1980), closeness of relationships (Berger and Calabrese 1975) or interaction frequency (Granovetter 1973; Weiligmann 1999; Gilbert, Karahalios, and Sandvig 2008).

In this study, ties are considered strong when frequently contacted interpersonal sources are validated as important information sources. In our model, we use communication frequency with other farmers and participation frequency in agricultural organizational meetings as proxies for contact frequency. The variable 'validation of information sources' describes the importance of the information on AEM that is received from the interpersonal network as perceived by surveyed farmers. The measurement is consistent with Weimann (1982), who treats contact with high frequency as a strong tie if there is simultaneously high contact importance.

Based on this theory, we develop and test the following hypotheses:

H4a (informal network): Farmers who communicate with other farmers with high frequency are more likely to consider other farmers as an important source of information about organic farming issues.

H4b (formal network): Farmers who participate in agricultural organizations' events with high frequency are more likely to consider formal network actors (e.g., interest groups, cooperatives and government agencies) as an important source of information about organic farming issues.

## Sample Description

The dataset available for the analysis consists of 52 organic farmers located in central Germany (Saxony-Anhalt, Saxony, Lower-Saxony, Brandenburg, Thuringia, and North

**Table 1.** List of additional adopted Agri-Environmental Measures (AEM) Germany, 2000–2008

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Crop diversification (Fruchtartendiversifizierung)
Mulch seeding (Mulchsaat)
Nature conservation (Naturschutz)
Land cultivation adapted to market and location (Markt-und standortangepasste Landbewirtschaftung)
Cultural landscape programme (Kulturlandschaftsprogramm)
Environmental protection, forestry (Agrarumweltmaßnahmen und Waldmehrung)
Solid manure program (Festmistprogramm)
Wetland protection (Feuchtwiesenschutz)
Diversified crop rotation (Vielfältige Fruchtfolgen)
Dairy cows grazing (Weidehaltung von Milchkühen)

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Source: FOODIMA Survey.

**Table 2.** Characteristics of organic farmers ( $n = 52$ ), Central Germany, 2008 (two-sample t-test results)

Variables	Mean AEM Adopters (n=16/30%)	Mean Non-Adopters, (n=36/70%)	P-Value
<i>Farmer/Farm characteristics</i>			
AGE	51.60	48.41	0.413
EDUCATION	15.87	16.05	0.784
FARM_SIZE	212.47	142.61	0.39
FARM_SOIL_Q	2.47	2.88	0.054*
FARM_INCOME	2.31	2.91	0.193
CONVERSION_Y	1993	1996	0.037*
<i>Interpersonal networks informal network</i>			
NETWORK_SIZE	7	9.73	0.526
AGE_RCF	45.14	47.5	0.272
EDUCATION_RCF	16.84	15.46	0.077*
FARM_SIZE_RCF	270.76	173.90	0.372
INNOVATIVENESS_RCF	7.07	6.96	0.861
COMMUNICATION_FREQ	50	58.08	0.256
<i>Formal network</i>			
MEMBERSHIP	0.82	0.85	0.79
PARTICIPATION_FREQ	1.94	1.85	0.758

Notes: Significance levels: \* =  $p < 0.10$ , \*\* =  $p < 0.05$

Description of variables:

AGE: Age of surveyed farmer (years).

EDUCATION: Education of surveyed farmer (years).

FARM\_SIZE: The sum of arable and grassland: total land (ha).

FARM\_SOIL\_Q: German soil value for farmland (Bodenwertzahl 1–100) (Ordinal Scale 1–5).

Low=1 for “< 25”, 2 for “26–45”, 3 for “46–65”, 4 for “66–85” and High=5 for “> 85”.

FARM\_INCOME: Share of income from farm activities (Ordinal Scale 1–4).

1 for “<50%”, 2 for “=50%”, 3 for “<50%” and 4 for “=100%”.

CONVERSION\_Y: Year of conversion to organic farming.

NETWORK\_SIZE: Number of regularly contacted farmers by surveyed farmers.

AGE\_RCF: Age (year) of farmers regularly contacted by surveyed farmers.

EDUC\_RCF: Education (year) of farmers regularly contacted by surveyed farmers.

FARM\_SIZE\_RCF: Farm size (ha) of farmers regularly contacted by surveyed farmers.

INNOVATIVENESS\_RCF: Innovativeness of regularly contacted farmers, this score reported by surveyed farmers (Ordinal Scale 1–10); 1 for ‘hardly accept an innovation’ and 10 for ‘easily accept an innovation’.

COMMUNICATION\_FREQ: Communication frequency with other farmers (%); 0 for ‘not at all’ and 100 for ‘very frequently’.

MEMBERSHIP: Membership in agricultural organizations that are relevant for or involved in agri-environmental programmes (1=Member, 0=Non-Member).

PARTICIPATION\_FREQ: Participation frequency in agricultural organizations’ events (Ordinal Scale 0–4)

0 for “not at all” and 4 for “very frequently”.

Rhine-Westphalia). The data were collected during face-to-face interviews with farm managers participating in the EU-funded Food Industry Dynamics and Methodological Advances (FOODIMA) project in 2008. The survey provides information about adopted AEM by organic farmers, farm and farmers’ characteristics and relationships in the interpersonal communication network. In the analysis, the adopted AEM were cited by organic farmers as an answer to the open question ‘Have you participated in other AEM? If so, what measures have you undertaken?’ Single additional AEM differ between the German federal states; however all organic farmers in the study regions have access to a number of AEM they can choose from. We observe that approximately 70% (36 farmers)

of the surveyed organic farmers had not adopted additional AEM by the survey year (2008). The additional AEM adopted by 16 organic farmers are listed in the [Table 1](#).

The present study does not explicitly consider the requirements of adopting other AEM. The innovativeness of an organic farmer towards additional AE programmes is captured solely by the variable describing the presence or absence of adopting other AEM. The differences between additional AEM adopters and non-adopters are analysed using a t-test ([Table 2](#)). The t-test results show that the means of the considered variables that characterize these two groups are significantly different from one another in three tested variables. First, organic farmers who adopted additional AEM cultivate land with significantly lower soil quality than non-adopters. Second, additional AEM adopters converted to organic farming earlier than non-adopters. Third, education levels are higher for farmers who adopted additional AEM.

### **Logit Model**

The following section addresses the diffusion of additional AEM among organic farmers and, more specifically, the question of whether contact frequency in interpersonal networks influences the adoption behaviour of additional AEM by organic farmers.

#### *Method*

The majority of studies on AEM adoption analyse the choice problem using discrete choice models (logit or probit). These studies consider the adoption decision as a dichotomous problem (1 = adopters and 0 = non-adopters) for estimation (Cramer 1991; Crabtree, Chalmers, and Barron 1998; Wynn, Crabtree, and Potts 2001; Vanslebrouck, Van Huylenbroeck, and Verbeke 2002; Polman and Slagen 2008; Hurlle and Goded 2007).

The difference between the logit and the probit model lies in the distribution function of the error term. In the logit model, errors are assumed to follow the standard logistic distribution, whereas in the probit model, errors are assumed to be based on the standard normal distribution. Having applied both models, the choice of which to use in the study is derived from the results of models' (R-squared) explanatory power (Crabtree, Chalmers, and Barron 1998). Because the R-square is slightly lower in the probit model, the logit model is selected for the analysis. The employed dependent variable is specified as:

$Y_i = 1$  if the farmer adopts a minimum of one additional AEM by the survey date.

$Y_i = 0$  if the farmer does not adopt any additional AEM by the survey date.

The logit model used in this study is specified as:

$$Y_i = \beta X_i + \mu_i$$

where  $\beta$  = vector of parameters,  $X_i$  = vector of independent variables, and  $\mu_i$  = error term.

In the model, variables are divided into two main groups: the characteristics of farms and farmers and the characteristics of interpersonal networks. The characteristics of farms and farmers are used as control variables. Based on the results of previous studies on the influence of farmers' characteristics (Bonnieux, Rainelli, and Vermersch 1998; Vanslebrouck, Van Huylenbroeck, and Verbeke 2002), we include age and educational level as the estimation variables. For the farm characteristics, by taking into account the

results of studies that investigate the importance of farm characteristics (Wynn, Crabtree, and Potts 2001; Polman and Slagen 2008), variables for farm size, the share of income coming from farm activities and farm soil quality (expressed in German Agricultural Land Grades) are included. To test the influence of being an experienced adopter on the acceptance of additional AEM, the number of years of experience in organic farming is used. The characteristics of formal and informal networks are included in the interpersonal network characteristics. The influence of communication frequency with other farmers and the characteristics of farmers with whom others regularly communicate about agricultural issues are tested (age, education and innovativeness as perceived by surveyed farmers). Finally, in the formal network, the degree of attachment to agricultural organizations (farmers' associations) and participation frequency in these organizations' events is considered.

The probability of being an adopter is given by:

$$\Pr (Y_i = 1|X_i) = F(\beta X_i) = \frac{\exp(\beta X_i)}{1 + \exp(\beta X_i)}$$

We checked the potential problem of multi-collinearity between the explanatory variables of the model by applying two commonly used tests. First, using Menard's (2002) approach, we calculated the variance inflation factor (VIF) by constructing an ordinary least squares (OLS) regression with the same variables in the equation. The results show a mean VIF value of 1.49. Because the acceptable upper critical limit is 10.0 (Chatterjee and Hadi 2006), we consider that there is no correlation among variables. Second, we checked the pair-wise correlation coefficient between explanatory variables. Within the total coefficient values of the model, the values ranged from 0.003 to 0.41. The absence of coefficient values larger than 0.5 indicates weak correlation between variables. Based on the results of these two tests, we conclude that there is no multi-collinearity problem in the model.

### *Results and Discussion of the Logit Model*

Table 3 reports the results of the logit model estimation for adopters and non-adopters of additional AEM within the group of organic farmers. Due to missing values, the total number of observations decreased to 43 farmers. In the model, a likelihood ratio test is used to compare the fit of null and alternative models, which is 18.11 with nine degrees of freedom (LR chi2 (12): 18.11). Tested predictors were treated as significant when the p-value was lower than 0.10.

Regarding the variables of farm and farmer characteristics, the farmer's age, the farm's soil quality and year of conversion to organic farming are significant in the model of adoption of additional AEM by organic farmers.

A positive coefficient sign for age indicates that older organic farmers (aged 60 years and over, and 35–60 years) are more likely to adopt additional AEM than younger farmers. This result should be interpreted with caution, however, because of the low number of organic farmers over 60 years old. This finding contradicts the results of other studies on AEM adoption (Vanslebrouck, Van Huylbroeck, and Verbeke 2002; Wynn, Crabtree, and Potts 2001; Bonnieux, Rainelli, and Vermersch 1998). In these studies, age was confirmed as having a negative significant effect, indicating that younger farmers are more likely to adopt AEM. A possible explanation is that when considering organic farmers, those who are older are more experienced with AEM practices and are therefore

more likely to adopt other voluntary AEM than younger and less experienced organic farmers.

The estimates of the year of conversion to organic farming confirm that early adopters of organic farming practices are more likely to adopt additional AEM. This result is supported by Sutherland and Darnhofer's (2012) study based on qualitative interviews with organic farmers. The study finds that organic farmers' attitudes towards environmental practices evolve over time, and explains that this evolution is influenced by two factors: farmers' previous individual experiences and their observations of other farmers' environmental practices. The study indicates that producing food while respecting the environment by applying organic practices becomes a personal and professional challenge that creates new perceptions and priorities in rural areas.

The negative significant sign for soil quality indicates that farms located in less favourable areas have a greater likelihood of adopting additional AEM, which is similar to results from other studies on conventional farmers' conversions to organic farming practices (Sutherland and Darnhofer 2012; Schmidtner et al. 2011). Schmidtner et al. (2011) show that farms located in less favourable areas of Germany are more likely to convert to organic farming than farms in more fertile areas. This can be explained by higher opportunity costs in fertile areas compared to less favourable areas.

A positive sign for estimates for the variable 'education of farmers in regular communication' confirms that farmers who communicate regularly with more educated

**Table 3.** Results of logit analysis, adoption of additional Agri-Environmental Measures (AEM) by organic farmers

Parameters	Coef.	Std Error	P> z
<i>Farmer/Farm characteristics</i>			
AGE	0.135	0.080	0.093*
EDUCATION	1.756	1.300	0.177
FARM_SIZE	0.001	0.003	0.649
FARM_SOIL_Q	-2.11	1.244	0.090*
FARM_INCOME	-1.515	1.349	0.261
CONVERSION_Y	-0.160	0.096	0.095*
<i>Interpersonal networks informal network</i>			
AGE_RCF	-0.180	0.091	0.050**
EDUCATION_RCF	0.609	0.337	0.071*
INNOVATIVENESS_RCF	-0.038	0.295	0.896
COMMUNICATION_FREQ	0.018	0.022	0.410
<i>Formal network</i>			
MEMBERSHIP	-0.722	1.643	0.660
PARTICIPATION_FREQ	0.715	0.588	0.224
CONSTANT	310.995	190.038	0.102

Notes: Number of observations: 43 / LR chi2(9): 18.11/ Pseudo R2: 0.3436

Significant levels: \* = p < 0.10, \*\* = p < 0.05

Used dummy variables (additional to the given description variables in Table 2, here we provide three dummy variables created by the user in order to estimate the results of predictors' interactions):

FARM\_INCOME=0 for '≤45% or <45% share of income from farm activities',

FARM\_INCOME=1 for '=46% or >46%'.  
 FARM\_SOIL\_Q = 0 for '<45 or =45 Bodenwertzahl' (German soil value for farmland),

FARM\_SOIL\_Q = 1 for '=46 or >46 Bodenwertzahl'.  
 EDUCATION=0 for '<16', EDUCATION=1 for '17 or >17 years of education'.

farmers have a greater likelihood of adopting additional AEM. Thus, H2 (the higher the education level of regularly communicating farmers, the higher the probability of others adopting additional AEM) was corroborated.

With respect to other characteristics of actors in frequent communication over informal networks, age is a significant determinant in the adoption model. The negative sign for the age variable implies that regular communication with younger actors positively influences older actors' willingness to adopt additional AEM.

The degree of innovativeness of regularly communicating farmers did not prove to be a significant variable for explaining adoption behaviour. Thus, hypothesis H3 (the higher the innovativeness of regularly communicating farmers, the higher the probability of others adopting additional AEM) was not confirmed.

Neither communication nor participation frequency in informal and formal networks explains the adoption of additional AEM by organic farmers. Thus, with respect to the relationship between adoption behaviour and interpersonal networks, hypothesis H1a (the higher the communication frequency with other farmers on agricultural issues, the higher the probability of adoption of additional AEM by organic farmers) and H1b (the higher the participation frequency in agricultural organizations, the higher the probability of other organic farmers adopting additional AEM) are not supported.

Our study found that neither communication nor participation frequency in the informal and formal networks explain the adoption of additional AEM by organic farmers. These findings for informal networks contradict the findings from studies stressing the importance of repeated collaboration and contact frequency between actors in networks that increased innovativeness (e.g. Monge, Hartwich, and Halgiam 2008; Paruchuri 2010; Chassagnon and Audran 2011). Our results for formal networks show that there is no significant effect of participation frequency in agricultural organizations on the adoption of AEM. This finding differs from the study conducted by Mathij (2003) on innovation diffusion in rural areas, which shows that farmers who participate in association meetings are more likely to adopt AEM. Our results also differ from the study by Polman and Slangen (2008), who find negative effects for participation in agricultural organizations on the adoption of AEM.

### **Social Network Analysis (SNA)**

As cited in the literature review, in some studies, communication frequency alone—without considering the perception of the importance of the information transmitted—is used to explain the influence of interpersonal relationship on innovative behaviour. To show whether such an approach is sufficient, we decided to explore whether frequently contacted information sources are validated as important sources of information on organic farming by farmers. From a policy-making perspective, it is useful to understand how organic farmers evaluate information sources on organic farming before adoption and how adoption rates might be increased among farmers, e.g., how to diffuse information more efficiently to the group by occupying the appropriate sources. Therefore, farmers who communicate infrequently are eliminated from the analysis. Interpersonal ties that illuminate the flow of information are investigated using SNA (Wasserman and Faust 1994).

Method

Generally, SNA studies the ‘behaviour of the individual at the micro level, the pattern of relationships at the macro level, and the interactions between the two’ (Stokman 2001, 509). Social entities in a network are referred to as actors, i.e., discrete individual, corporate, or collective social units (Wasserman and Faust 1994). Several approaches are deployed to study relationships in interpersonal networks. Our study uses personal interviews in which each respondent (ego) reports on which interpersonal information sources (alter) it is tied to and with what intensity. The measurement of such personal networks (ego-centred networks) can be found in studies in fields as diverse as anthropology, psychology, medicine, sociology and agricultural studies (Bott 1957; Wellmann 1993; McCarty et al. 2001; Thuo et al. 2013). Interpersonal network characteristics based on personal interviews with organic farmers are presented in Table 4.

While egos represent organic farmers in the interpersonal network analysis, two alters represent interpersonal information sources of agricultural organizations (formal) and other farmers (informal). Ties from ego to alter are established via bilateral communication or group meetings in which actors share ideas and/or social relationships. In the analysis, we assume that ties from alter to ego are established as a consequence of the interaction between ego and alter. Based on the interaction experience, the ego validates the importance of shared ideas and/or gathered information.

The SNA allows us to measure the relational aspects of social structure using tie strength in the network. To measure the strength of ties, we adopted the approach developed by Weimann (1982), who defines ties between ego and alter as strong if these actors have frequent contact and the ego rates the information received as being of high importance. These two proxy variables, which determine tie strength in our study, are described as follows:

*Contact Frequency.* To quantify the informal communication frequency of organic farmers, the survey asked the question ‘How often do you communicate with other farmers about agricultural issues?’ To quantify their contact frequency, we asked them, ‘How often do you participate in the agricultural organization’s events?’ For both questions, the degree of interaction frequency was ranked on a percentage scale (0 to 100%). In the contact matrix, the threshold level of having high contact frequency is constructed by

**Table 4.** Network characteristics with interpersonal communication aspect

Interpersonal network	
Ego	Organic farmer
Alter	Interpersonal information sources (formal; informal)
Ties from Ego to Alter	Communication; meeting participation frequency (high; low)
Input	Idea; friendship, etc.
Ties from Alter to Ego	Validation of the importance of information sources (high; low)
Output	Evolution of ideas
Tie strength	Contact frequency, contact importance
Objective variable	Exchange of information, ideas and knowledge
Medium	Oral (face-to-face) communication

Source: Adoption from the studies of Beckmann 1994 and Kobayashi and Fukuyama 1998.

translating the top half of the communication and participation frequency percentages (>50%) of farmers into 1s as a **high contact frequency** and the other half ( $\leq 50\%$ ) into 0s as a **low contact frequency**.

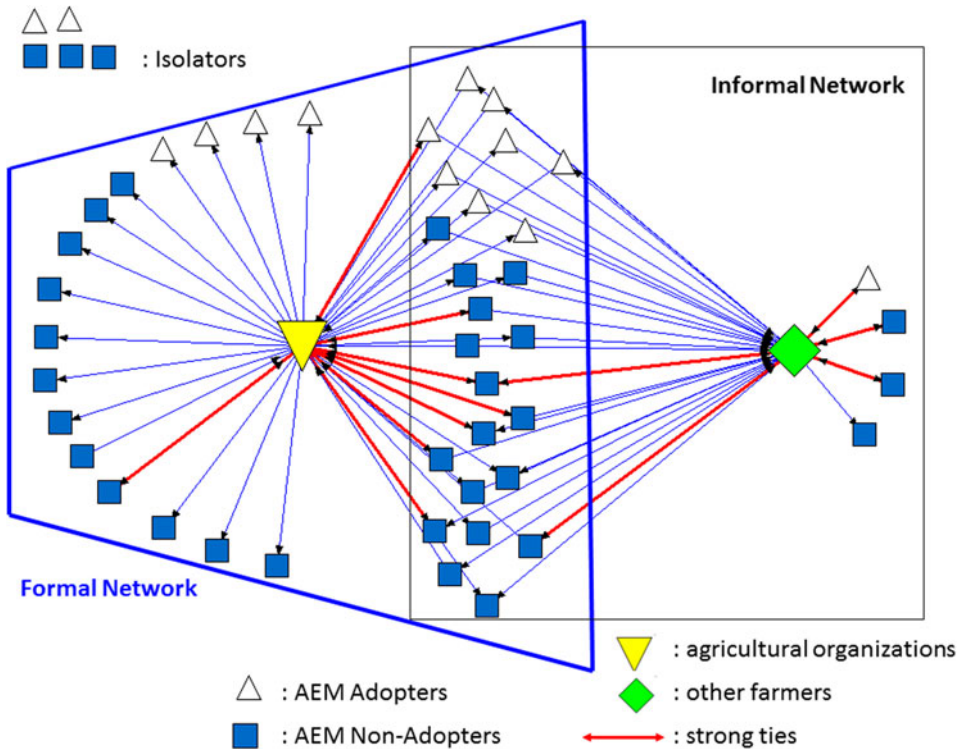
*Information Validation (Contact Importance)*. Information sources in rural areas are examined in several studies that focus on the use of information (Ortmann et al. 1993), factors that influence attitudes towards information sources (Gloy, Akridge, and Whipker 2000), or information preferences of farmers (Pompelli et al. 1997; Schnitkey et al. 1992). In our study, the variable of information validation is measured as ranked by farmers. Farmers were asked to rate the importance of 15 information sources that may be categorized into three groups: other farmers, agricultural institutions and the media. The question asked was ‘How do you rate the importance of the listed information sources on organic farming for you before adoption?’ The degree of validation of each information source was ranked on a percentage scale so that the sum of the validations is 100%. Regarding the distribution of rankings in the matrix, a high percentage of responses (more than 33%) were translated into 1, which represents **high information validation**, and a low percentage (less than 33%) into 0, which represents **low information validation**. We do not consider the importance of media (magazines, book, radio, television) in this study and consider formal and informal interpersonal communication only.

#### *Results and Discussion of the Social Network Analysis*

Figure 1 shows the interpersonal ties in the structure of network actors for a sample of organic farmers (n=52) in central Germany. Due to missing values, the total number of organic farmers decreased to 50. From the 50 organic farmers, those who communicate infrequently are eliminated from the analysis and shown as isolators (n=5). Two different symbols represent frequently communicating farmers (n=45) that distinguish among adoption behaviour; additional AEM adopters are represented by a triangle and non-adopters by a square. The network consists of 50 egos and two alters that represent organic farmers and interpersonal information sources (agricultural organizations and other farmers), respectively. The tie from ego to alter indicates farmers’ high contact frequency with the tied alter. The tie from alter to ego indicates the farmer’s high information validation of the alter. The right side of the network depicts ties within the informal information network and the left side of the network depicts the formal information network; strong ties are highlighted in red, and indicate that the tied organic farmers (egos) have a high level of contact frequency with the interpersonal network actor (alter) and simultaneously rate that source as having high level of importance for them as an information source.

The aim of SNA is to understand the relationship between contact frequency and information validation variables, regardless of the adoption decision. The determinants that are not shown in the figure are depicted in detail in Table 5, which shows the results of interpersonal network analysis for formal and informal networks separately. Regarding the research question, the contact matrix relationships are shown in a star network structure consisting of a central node to which all other nodes are connected. In the network, the central node provides a common connection for all nodes. Thus, the proportion of actual ties to the possible ties that are defined as connectedness is low for both the formal and informal networks. Additionally, the standard deviation between





**Figure 1.** Interpersonal communication network of organic farmers ( $n = 50$ ), central Germany.  
*Source:* Own analysis, FOODIMA Survey.

actors with respect to the number of distributed ties is low, which indicates that the population in both the formal and informal networks represents a homogeneous group because there is low variance in terms of their connectedness within the network.

The interpersonal network consists of 83 ties that represent both high contact frequency (ties from ego to alter) and high information validation (ties from alter to ego), which breaks down to 49 formal and 34 informal ties. This finding indicates that formal ties are more important in information exchange than informal ties. In this informal network, the alter of other farmers is an actor that mostly provides information to farmers who also have support from formal network ties.

The sum of egos gives the total number of organic farmers connected to the formal and informal interpersonal networks separately. While 82% of actors are connected to formal networks, 58% of actors are connected to an informal network. One explanation for the greater number of actors being connected in the formal network is the high number of ties (68%) from alter to ego. These ties represent high information validation by farmers and are provided by the agricultural organizations' alter.

Interpersonal network analysis shows that the sum of strong ties is eight for the formal and five for the informal network. This implies that, while in the formal network, 19% (8/41) of frequent participants in agricultural organizations indicated that information coming from these organizations was important for them; in the informal network, 17% (5/29) of

**Table 5.** Interpersonal network analysis for organic farmers, Central Germany

Characteristics	Formal network	Informal network
Connectedness	0.019	0.013
Std deviation	0.137	0.115
Sum of egos	41 (82%)	29 (58%)
Sum of ties	49	34
Ego to Alter ( <i>high contact frequency</i> )	15 (30%)	20 (40%)
Alter to Ego ( <i>high information validation</i> )	34 (68%)	14 (21%)
Sum of strong ties	8	5
Proportion of strong ties (Sum of strong ties/ties from ego to alter)	0.53	0.25

Source: FOODIMA Survey (percentages within the parentheses show the proportion of related actors to the total number of whole network level egos that represent organic farmers).

organic farmers who communicate frequently with other farmers indicated that these farmers are an important source of information for them.

We hypothesized that farmer A is more likely to give importance to the information coming from source B if farmer A has previously cited B as a source that he contacts frequently. To measure whether the tendency of a tie from A to B is reciprocated by a tie from B to A, we used tie-based reciprocity analysis to calculate the proportion of strong ties among all connected ties from ego to alter. As a result (Table 5), we found that the proportion of strong ties is higher (0.53) in the formal network relative to the informal network (0.25). This indicates that 53% of farmers who participate in agricultural organizations frequently report agricultural organizations, research institutes and extension agents as sources of information about organic farming issues that are highly important for them prior to the adoption decision.

A binomial probability test was used to test the statement, ‘At least 50% of ties from ego to alters are reciprocal’ for the two interpersonal networks. Although hypothesis H4b (farmers who participate in agricultural organizations’ events with high frequency are more likely to consider formal network actors as an important source of information on organic farming issues) was confirmed for the formal network, hypothesis H4a (farmers who communicate with other farmers with high frequency are more likely to consider other farmers as an important source of information on organic farming issues) was not confirmed for the informal network, at a significance level of  $p < 0.05$ .

Previous studies that considered conventional farmers’ decision-making on adopting AEM found that interpersonal networks such as friends and colleagues are the most important sources of information (Retter, Stahr, and Boland 2002; Drake, Bergström, and Svedsäter 1999). Our results indicate that other farmers are indeed a frequent source of information, but that the information gained from them is in general not valued, relative to formal sources, as highly important for adoption of AEM with extensive requirements such as organic farming.

Regarding formal information sources, the survey conducted in Germany by Prager and Nagel (2008) shows that farmers contact agricultural organizations when they are seeking information on the application, scheme requirement, and responsibility issues associated with AEM. We assume that because they provide this type of information, agricultural organizations are evaluated as an important source of information by the

farmers in our study. Thus, formal information exchange must be considered as having a substantial capacity to influence the managerial decisions of frequent participants. This applies in particular to AEM with extensive requirements such as organic farming.

In line with the social network studies (Granovetter 1973; Lin 1999), we argue that it is important for organic farmers to maintain ties with actors attached to both informal and formal networks to obtain new ideas and relevant information. Formal networks allow organic farmers to enter other networks in which they can obtain different types of information than in informal networks. Such interactions can help organic farmers to keep their informal networks open to new entrants.

## **Conclusions and Implications**

We use the logit model to predict the influence of interpersonal contact frequency on adoption behaviour, and use the social network model to explain the relationship between contact frequency and information validation in farmers' interpersonal networks. While the logit model analysis examines which interpersonal communication network factors influence the adoption decision, SNA considers validation of the importance of the information that is transmitted by interpersonal communication.

Considering the results from both the logit model and SNA, practical implications are derived for using informal and formal information networks to distribute information effectively to increase AEM adoption.

The result of the logit model shows that being an early adopter of organic farming positively influences the adoption of additional AEM. Further, the study by Sutherland and Darnhofer (2012) highlights the importance of having previous experience with environmental practices on the continuity of good farming practices. These authors suggest that formal agencies should provide feedback to farmers on environmental gains that have been achieved by adopting environmental farming practices.

Our results are in line with this suggestion and imply that a platform should be provided that would enable organic farmers to recognize the environmental benefits that they achieved by adopting environmental farming practices. Using this platform farmers could exchange their own information on the environmental benefits they received after adopting AEM. Frequently communicating with young and highly educated farmers who can be considered as informal opinion leaders promotes AEM adoption. If these farmers are approached by extension services, an effective diffusion of given information in the region can be expected. Moreover, it is useful for extension services to create discussion groups among organic farmers that include opinion leaders. Similar groups were already established to improve farm businesses and farm profitability, e.g. in Ireland, New Zealand and the UK (ADAS 2008; Boyle 2012). In Germany, discussion groups established by state agencies do not exist. Establishing such groups could be useful, especially for small and less profitable farms that are less able to pay for extension services.

Even though frequent participation in an agricultural organizations was not found to explain adoption of other AEM, the results of SNA show that organic farmers who participate in agricultural organizations' events with high frequency are more likely to consider formal network actors as an important source of information on organic farming issues. Thus, distributing information through formal information channels in combination

with using informal channels should be considered as having a substantial capacity to influence the diffusion of AEM practices.

The research presented here might be extended in at least two directions. First, the current study does not focus on any one type of AEM adopted by organic farmers. That is, we included all accepted AEM without distinguishing between their requirements. We also limited our analysis to formal and informal interpersonal networks and excluded the influence of the media on adoption behaviour. Considering the role of media in the adoption process might further refine our understanding of the role of information behaviour in this process.

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# INNOVATION AT RURAL ENTERPRISES: RESULTS FROM A SURVEY OF GERMAN ORGANIC AND CONVENTIONAL FARMERS

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The purpose of this study is to examine the influence of interpersonal networks and other information sources on the innovativeness of farmers. This understanding can be useful for organizations that are involved in extension work that aims to increase the farmers' innovativeness and for farmers who aim to be more innovative. The study focuses on two types of farmers' network ties: friendship ties (ties to other farmers) and affiliation ties (ties to associations). Additionally, the importance of information gathered by farmers from interpersonal sources and from media is compared. We collected data within the European Union (EU)-funded Food Industry Dynamics and Methodological Advances (FOODIMA) Project using face-to-face interviews. Our sample, which consists of 72 farmers (organic and conventional) in Germany, was used to map farmers' innovativeness (number of innovations adopted). We analyzed the data to determine if the structure and strength of network ties can be used as predictors of innovativeness for organic and conventional farmers. When considering both the friendship and affiliation ties, the main results show that organic farmers who communicate more frequently with other farmers are more likely to be highly innovative. The large network size indicates low innovativeness on the part of organic farmers. Membership in at least one association is positively interconnected with high innovativeness of conventional farmers. Regarding information sources, the results indicate that the highly innovative farmers appreciate information from research institutes more and information from agricultural organization less than the less innovative farmers.

Key words: Innovativeness; Social network ties; Communication frequency; Information sources; Organic and conventional farmers

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## INTRODUCTION

The importance of knowledge and information exchange in the innovation process has been acknowledged by sociological and economical researchers as well as by European Union (EU) policy decision makers. Policy measures, such as those supporting the development of Agricultural Knowledge and Innovation Systems (AKIS), have been introduced in the last decade in the EU. AKIS

is defined as “a concept to describe a coherent system of innovation, with emphasis on the organizations involved, the mutual links and the many interactions between them, including the institutional infrastructure with its incentives and its budget mechanisms” (15). Governmental intervention in innovation processes is justified, as innovations not only benefit those who innovate but also produce positive externalities such as more jobs, higher incomes, and safer

working conditions. Since investors in innovation do not take these external effects into consideration, it can lead to underinvestment. Moreover, policy instruments in the field of innovation can mitigate negative external effects such as environmental pollution in agriculture and food production.

In preparation for the EU Common Agricultural Policy for 2014–2020, the Coordination Committee's Focus Group (FG) on Knowledge Transfer and Innovation (KT&I) was established with the aim to provide recommendations to member states about how to promote KT&I in the next programming period. Using case studies within the EU countries, the KT&I focus group identified the following actors as being involved in the innovation process: farmers and their organizations, agrifood businesses, research institutes and/or universities, formal or informal networks, national rural networks, public or regional administrations, and local action groups (15). Knowledge transfer between partners is identified as a precondition or a significant part of the innovation process. Knowledge transfer in particular makes identifying innovation opportunities possible.

The importance of intermediates (e.g., networks and associations) for innovation diffusion is stressed in the literature. As shown in the study by Bokelmann et al., the food supply chain actors in Germany highly appreciate the economic independence of such platforms (7). This independence creates trust and diminishes risk considering the trustworthiness of information and implementation of recommendations. Using primarily qualitative research methods, Bokelmann et al. stress the positive role of networks in the innovation process and recommend their professionalization and support by policy (7). On the other hand, the authors, like some other experts, assess the role of producers' interest representing associations as structure conserving and thus rather unimportant in the innovation process. Membership in an association, however, is seen as increasing the social network and thus the social capital of its members. A higher level of social capital is connected with an increasing probability of innovation adoption (49).

These inconsistencies show that further research is needed to increase the understanding of the links between network ties and innovation diffusion. The purpose of this study is to examine the influence of interpersonal networks and other information sources on the innovativeness of farmers. This

understanding can be useful for farmers who aim to be more innovative and/or for farmers' organizations that are involved in extension work that aims to increase farmers' level of innovativeness.

This study's focus is twofold. First, the study examines whether interpersonal network ties' attributes are associated with the number of innovations (innovativeness) adopted by farmers. Second, the article proposes a means of measuring the importance of interpersonal information sources for farmers and investigates factors that influence the farmers' perception of interpersonal sources, such as agricultural organizations, research institutes, and extension agents. By comparing the results of organic and conventional farmers, the study contributes to the general understanding of innovation adoption behavior in various network structures. As such, we seek to answer the following questions:

1. Do interpersonal network ties' structure and strength influence the innovativeness of organic and conventional farmers, respectively?
2. How do farmers evaluate the importance of interpersonal and media information sources in the innovation adoption process? Are there differences in the evaluation of importance of sources between organic and conventional farmers?
3. What are the determining factors that cause a change in the farmers' perception of the importance of interpersonal sources?

In an effort to answer these questions, we use diffusion and decision-based theoretic models on innovation adoption. The most often used models are the logit and the probit discrete choice models. These models of adoption assume that a decision to adopt or not to adopt an innovation at a specific time is the outcome of profit-maximizing behavior. Heterogeneity among potential adopters determines the decision to adopt or abstain.

In this article, we use the logit model and ordinary least squares (OLS) regression to investigate how farmers' communication/contact frequency with neighborhood farmers (friendship ties), and farmers' associations (affiliation ties) influence innovativeness, expressed as number of innovations implemented. We also consider other factors (e.g., farmers and farm attributes) that influence the probability of innovation adoption for both organic and conventional

farmers. Furthermore, we investigate whether farmers assign more importance to interpersonal information sources or to information from the media.

The study is divided into five sections. In the following section, besides the definition of the concept of innovativeness, a literature review on social networks and the farmers' interpersonal sources provide our theoretical framework. The third section details the utilized FOODIMA dataset and methodology. In the fourth section, our results are presented in two subsections: regression results from the degree of innovativeness models and interpersonal sources analysis. In the last section, we discuss the results of the proposed models and derive implications.

## LITERATURE REVIEW

### Definitions

*Innovations* are commonly defined as the successful exploitation of creative ideas. Innovations are considered an engine of firms' competitiveness and thus a driver of economic development. We use the term "innovation" according to the "Guidelines for Collecting and Interpreting Innovation Data," where innovation is defined as follows: "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. . . . The minimum requirement for an innovation is that the product, process, marketing method or organisational method must be new (or significantly improved) to the firm. This includes products, processes and methods that firms are the first to develop and those that have been adopted from other firms or organisations" [(45), see also (15)].

*Innovativeness* is defined as "the notion of openness to new ideas as an aspect of a firm's culture" (26). In a small firm, innovativeness implies the willingness of the owner to learn about and adopt innovations, both in the input and output markets (46). In this study, we measure the innovativeness of a farm as the number of innovations introduced during the previous 20 years.

*Innovation diffusion* is defined by Valente as the "spread of new ideas, opinions, or products throughout a society, thus diffusion is a communication process in which adopters persuade those who have not yet adopted to adopt" [(47), see also (48)].

Knowledge is the main source of innovation and is one of the most valuable assets of an organization. Indeed, knowledge can be transferred between actors through interpersonal communication. We identify the term *interpersonal communication* as a "process of message transaction or transmission between people to create and sustain shared meaning," which occurs when synchronized exchange between the communicating parties takes place (50). The parties not only interact at the same time but also at the same place (28). Communication can take the form of bilateral communication, group meetings, and discussions (28).

The fact that some farmers first declined to adopt and then later decided to adopt can be explained by interpersonal influence. Interpersonal influence is defined by Cartwright as the "modification of one person responses by the action of another" (9). A number of studies were published analyzing who influences whom within the community on innovation adoption (2,34,40,48). Cobbenhagen argues that successful innovative enterprises are more externally oriented and deal more proactively with externally developed knowledge than do their competitors who follow innovation (11). A wealth of human and social capital, networking, supportive knowledge, and communication infrastructure all contribute to novelty production.

### Social Networks, Friendship Ties, and Affiliation Ties

In the field of innovation adoption, there is an increasing number of studies using the network approach that recognize the importance of social networks, particularly the influence of interpersonal communication channels on farmers' behavior (4,11,12,23,30).

To clarify the importance of contact in an interpersonal network, aside from the network approach, studies on social capital investigate factors that influence a farmer's decisions (33,39,52). For example, Coleman comments on the allocation of social capital thusly: "Unlike other forms of capital, social capital inheres in the structure of relations between actors and among actors" (13). Further, he describes the function of social capital: "Like other forms of capital, social capital is productive, making possible the achievement of certain ends that in its absence would not be possible" (13). Social capital is assumed

to lower transaction costs and to influence farmers' behavior (37).

In our study, we distinguish between friendship ties and affiliation ties. Friendship ties are ties to other farmers, whereas affiliation ties are to farmers' associations. Friendship ties are quantified using the concept of connectedness, where *connectedness* "is the degree to which the focal individual is linked to others. It is the size of the personal communication network measured in terms of the number of individuals reported by the farmer to be directly communicated with while making decisions on important farming matters" [(49), see also (42)]. In this study, we measure connectedness by the number of farmers that the considered farmer communicates with regularly on agricultural topics. Since connectedness represents the number of sources of information on new or novel farming ideas, Warruber and Moul hypothesize it to be positively related to the likelihood of innovation adoption (49). This hypothesis is supported by the findings of Diederer et al., who studied the influence of intensity of the stream of external information a farmer is exposed to regarding innovation adoption (14). The intensity measure was the number of agricultural cooperative initiatives of which a farmer is a member. These authors find that for Dutch farmers, the more farmers are involved in agricultural cooperative networks, the more likely they are to be early adopters of innovations.

Affiliation ties are measured by affiliation/non-affiliation to farmers' associations. Research on innovation diffusion in rural areas has shown that farmers' participation in organizations is an important determining factor for the adoption of different kinds of innovations (27). On the other hand, Bokelmann et al. conclude from their investigation in Germany that interest-representing associations are rather unimportant in the innovation process (7).

A number of studies stress the important role of repeated collaboration and contact frequency between network actors to increase innovativeness (10,22,29,36). Monge et al. indicate that farmers who have highly frequent conversations on technological changes in their network are more likely to adopt new knowledge and technology relative to other farmers who do not (32). In the social capital literature, participation frequency in agricultural organizations is the important variable that indicates a higher level of social capital (6,44).

### **Organic and Conventional Farmers' Interpersonal Networks Differences**

In order to contribute to understanding the drivers of both the conventional and organic farmers' innovation behavior, we compare factors influencing adoption behavior between these two groups of farmers. We especially consider these groups' interpersonal networks, their contact frequency, and the influence of these networks on innovativeness.

Two types of ties are distinguished in the theory: weak ties and strong ties (19). Weak ties maintain a higher variety of information flow between network actors, while strong ties increase the probability of information flow. Tie strength research based on Granovetter's theory uses different proxies of strength, such as communication reciprocity, closeness of relationships, or interaction frequency (5,16,17,19,51). Similarly, in our study, we use communication frequency with other farmers and participation frequency in agricultural organization meetings as proxies of tie strength. The higher the communication or participation frequency, the stronger the ties are. From exploratory empirical analyses, it seems that strong ties favor exploitation, and weak ties favor exploration, but additional evidence and deep theorizing on this and other connected issues are needed.

Studies show that organic farmers have strong ties in their interpersonal networks even over long distances (41). These farmers build relatively close networks, which are difficult for newcomers to enter (35). As previous studies demonstrate, a similarity of backgrounds and attitudes and the strong attraction felt by network members may diminish the innovation adoption, for which "weak" ties of dissimilar backgrounds in the network may be more effective (20,49). These findings support Bokelmann et al., who found that the interactions of farmers in smaller networks develop trustful relationships, which, however, can lead to separation from other actors and new technologies (7).

### **Information Sources**

In addition to the influence of communication frequency in interpersonal networks and the characteristics of informal network actors, innovation adoption behavior analysis also considers the validation of interpersonal sources by farmers (18,38).

We distinguish between interpersonal sources and media.

A survey carried out in 2008 by Hensche et al. in Mecklenburg-Vorpommern, Germany, of 66 farm managers identified farmers' professional magazines as the most important information source on agricultural issues; 82% of respondents use them often, while the others use them occasionally (24). Considering the interpersonal sources, the important information sources are a farmer's supplier, buyer and consultants, and other farmers. Further, 43% of farm managers use information from other farmers often, while 57% do so only occasionally.

The usefulness of personal sources and media as sources of information for commercial farms was examined for the US in 1998, with 1,742 farms participating in the survey (18). Possible factors influencing attitudes toward information sources were identified from the literature and tested. The results show that general farm magazines were one of the most useful information sources. In the case of interpersonal sources, 54.4% of farmers find other farmers at least often useful. The probability that farmers perceived this source often or always useful declined as age increased.

In our study, we test factors influencing the probability of using personal sources or media for information searches. We test whether information sources used differ between organic farmers and conventional farmers as well as between low innovators and high innovators.

Based on the literature review, we deduced seven hypotheses on farmers' innovativeness.

Strength of interpersonal ties:

**H1:** Having strong friendship ties indicates lower innovativeness of farmers.

**H2:** Having strong affiliation ties indicates higher innovativeness of farmers.

Degree of innovativeness:

**H3:** Farmers who communicate with their peers more frequently are more likely to be highly innovative.

**H4:** Farmers who have a large network size (connectedness) are more likely to be highly innovative.

**H5:** Farmers who participate in agricultural organizations' events more frequently are more likely to be highly innovative.

**H6:** Farmers who are attached to at least one agricultural organization are more likely to be highly innovative.

Interpersonal information sources:

**H7:** Highly innovative farmers value interpersonal information sources more than less innovative farmers.

## DATA AND METHODOLOGY

The dataset used for the analysis consists of 72 cereal farmers located in Central Germany. The data were collected in 2008 during face-to-face interviews with farm managers within the EU-funded FOODIMA Project. Two types of farmers—organic ( $n=52$ ) and conventional ( $n=20$ )—were surveyed in order to capture the innovation adoption behavior. The survey provides information on innovation adoption, farms' and farmers' characteristics, interpersonal communication network relations (formal and informal networks), and importance of sources of information on agricultural issues. Descriptive statistics for two study groups of organic and conventional farmers are reported in Table 1.

### Degree of Innovativeness

The first dependent variable, degree of innovativeness of farmers, was developed from the part of a questionnaire on innovation adoption capacity. Each respondent was asked to provide detailed information on innovations adopted on their farm over the previous 20 years. Indicated innovations were classified according to Community Innovation Survey's (CIS) definition of innovation in the Oslo manual innovation measurement framework (45).

CIS differentiates between four kinds of innovation: product innovation, process innovation, organizational innovation, and marketing innovation. Product innovation is the market introduction of a new good or service or a significantly improved good or service with respect to its capabilities. Process innovation is the implementation of a new or significantly improved production technology or process or distribution method. In the survey, we

**Table 1.** Descriptive Statistics

	Organic Farmers				Conventional Farmers			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Types of innovations								
Total innovation activity	1.84	1.47	0	5	2.40	1.60	0	6
Degree of innovativeness	0.27	0.45	0	1	0.35	0.49	0	1
Farmers' characteristics								
Age (year)	49.20	10.22	26	90	45.90	11.28	28	66
Education (year)	15.94	2.20	12	20	15.90	2.27	10	21
Farms' characteristics								
Farm form	0.55	0.1	0	1	0.3	0.47	0	1
Farm size (ha)	163.44	272.78	3	1665	679.32	772.62	45	2371
Share of farm income	2.83	1.26	1	4	3.25	1.07	1	4
Soil quality	2.75	1.05	1	5	3.15	0.81	1	4
Experience on organic farming practices (year)	12.17	5.36	2	27	-	-	-	-
Interpersonal network								
Friendship ties								
Strong friendship ties	0.34	0.48	0	1	0.35	0.489	0	1
Communication frequency	0.40	0.50	0	1	0.50	0.51	0	1
Network size (connectedness)	9.35	9.47	0	50	6.13	3.42	2	15
Age (year)	46.85	6.57	28	59	45.90	11.80	25	65
Education (year)	15.61	2.06	12	20	13.61	5.91	3	22
Innovativeness	7.04	1.81	3	10	6.20	2.68	1	10
Affiliation ties								
Strong affiliation ties	0.53	0.53	0	1	0.65	0.489	0	1
Membership status	0.85	0.36	0	1	0.75	0.44	0	1
Participation frequency	0.29	0.46	0	1	0.35	0.49	0	1

Description of categorical variables:

Farm form = 1 is grazing livestock and/or mixed farms; = 0 otherwise. Share of farm income = 1 for  $\leq 25\%$  of income coming from farm activities; = 2 for  $\leq 50\%$  of income coming from farm activities; = 3 for  $\leq 75\%$  of income coming from farm activities; = 4 approximately 100% of income coming from farm activities.

Soil quality shows the four scales of German soil value for farmland (Bodenwertzahl): = 1 for  $\leq 25$  German soil value; = 2 for  $\leq 50$  German soil value; = 3 for  $\leq 75$  German soil value; = 4 for German soil value.

did not observe any innovation adoption that could be classified as organizational innovation defined as the implementation of new or significant changes in enterprise structure or management methods. A marketing innovation is the implementation of new or significantly changed sales methods used to increase the appeal of the enterprise's goods and services or to enter new markets. Table 2 gives some examples of cited innovations by surveyed farmers.

Owing to the low number of cited products and marketing innovations, in the regression models, the sum of the four major types of innovation are used as the dependent variable that shows total innovation activity of farms (Table 1). More precisely, we used the sum of cited innovations that are

**Table 2.** Examples of Cited Innovation by Surveyed Farmers

Product innovation	Implementation of new products such as own sort of rye, carrot production, increased crop/seed varieties
Marketing innovation	Build direct marketing store, implement new regional marketing strategies
Process innovation	Crop rotation, precision farming, build storage for cereal stocking, using organic fertilizer, buying mulch seeder, potato sorting machine, carrier, cultivator, new tractor, investment for larger machinery, GPS navigation device, N-Sensor, telescopic wheel loader, biogas energy, solar energy, renewable energy

calculated as the types of innovation, where 0 = none of the four major types of innovation are implemented, 1 = one of the major types of innovation is implemented, etc. As seen in Table 1, the maximum value is 6 for conventional and 5 for organic farmers. The average values of 1.84 for organic and 2.4 for conventional farmers indicate that the innovativeness of organic farmers was lower than that of the conventional farmers over the examined period (1988–2008).

The degree of innovativeness model is based on the literature that concerns the enterprises' innovativeness as its past investments in innovation activities (3,26). We define innovativeness as an operationalized number of new ideas that had been adopted by the organization (26). Additionally, in the model, we do not explicitly consider the costs of innovation activity (21,43). Farms' innovation activity is examined in terms of number of adopted innovative projects, which was already calculated as an innovation adoption from the farmers' perspective. We separated farms into two degrees of innovativeness categories by clustering a total innovation activity variable. The cluster analysis led us to divide our sample into two groups: low degree of innovativeness (sum of cited innovations are less than or equal to 2; this holds for 52 farms) and high degree of innovativeness (sum of cited innovations are more than 2; this holds for 20 farms). Table 1 shows the degree of innovativeness variable within the division of organic and conventional farmer samples. The average value, 0.27 for organic and 0.49 for conventional farmers, shows that 27% of organic and 49% of conventional farmers are involved in the high degree of innovativeness cluster.

We conducted a regression analysis (logit regression for the organic and entire sample and OLS regression for the conventional farmer sample) when testing our hypotheses on the degree of innovativeness. Logistic regression estimates the probability of an outcome. Dependent variables are coded as binary variables with a value of 1 representing the occurrence of a targeted outcome and a value of 0 representing the absence of a targeted outcome.

OLS can be used to model the binary variables in linear probability models (31). Both models can be constructed with continuous, ordinal, and categorical independent variables.

The general logit regression model is

$$\text{logit}(p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k$$

where  $(\beta_0 \dots \beta_k)$  are maximum likelihood estimates of the logistic regression coefficients, and the  $X_s$  are vectors of the values for the independent variables. In our model, degree of innovativeness is a binary variable measuring the innovation adoption behavior of farmers. Coding  $Y_i = 1$  if case  $i$  is a farmer involved in a high degree of innovativeness cluster, and  $Y_i = 0$  otherwise, and then let  $P_i$  = the probability that  $Y_i = 1$ .

### Interpersonal Network

Two dimensions of interpersonal communication ties were created by grouping network ties under friendship and affiliation ties. Friendship ties were measured by communication frequency with other farmers, number of farmers frequently communicated with (network size), and characteristics of regularly communicated farmers. Affiliation ties were measured by membership status of farmers and participation frequency to agricultural organizations (Table 1).

A large part of the survey questionnaire was devoted to the farmers' interpersonal communication network. Farmers were asked to quantify (with a given rank) their communication frequency with other farmers on agricultural issues, as well as their participation frequency in an agricultural organization's events. This ranking led us to construct a dichotomous variable for communication and participation frequency variables [0 = farmers with low ( $\leq 50\%$ ) frequency rates, 1 = farmers with high ( $\leq 75\%$ ) frequency rates]. As seen in Table 1, the average value for the communication frequency is 0.40 for the organic and 0.50 for the conventional sample, indicating that while 40% of organic farmers communicate with high frequency, this percentage is 50% for conventional farmers. Similarly, we also observe a higher number of participation frequency (0.49) for conventional farmers relative to organic farmers.

With respect to friendship ties, each respondent was asked to provide detailed information on her/his three most frequently consulted friends, such as their age, education, and innovativeness. In the

model, we use the average of responses given as a characteristic of three frequently communicated friends. In Table 1, while the variable age and education of regularly contacted friends are presented as continuous variables, the innovativeness variable is depicted as a ratio scale with values ranging from 1 to 10 (1 = hardly accept an innovation in general, 10 = easily accept an innovation in general). Similar averages for the age and innovativeness of two study samples indicate that there are no large differences regarding the characteristics of organic and conventional farmers' friends (Table 1). However, the average value for years of education is 15 for organic and 13 for conventional farmers, which indicates that organic farmers' regularly contacted friends have slightly higher education compared to conventional farmers (Table 1).

Additionally, information was gathered on the membership status of farmers in agricultural organizations. The study constructs membership status as a dichotomous variable (Table 1). The value 1 indicates that the farmer is a member of at least one agricultural organization, and 0 indicates that the farmer is not a member of any agricultural organization. The average, 0.85 for organic and 0.75 for conventional farmers, indicates that while 85% of organic farmers are a member of one or more agricultural organizations, this number is slightly lower (75%) for conventional farmers.

Finally, with all the given interpersonal network variables, we construct dichotomous variables of friendship tie strength (0 = farmers that have a large network size and communicate with low frequency, 1 = strong friendship ties; farmers that have a small network size and communicate with high frequency), as well as affiliation tie strength (0 = farmers that are not attached to any agricultural organization and participate in agricultural organizations' events with low frequency, and 1 = strong affiliation ties; farmers that are attached to at least one agricultural organization and participate in agricultural organization events with high frequency).

### Interpersonal Information Sources

The second dependent variable, importance of interpersonal sources on agricultural issues, is examined for German farms. The importance of interpersonal sources is measured by the variable developed

from the survey where farmers were asked to rate the importance of 13 information sources. Each information source's perceived importance by farmers was ranked on a percentage scale so that the sum of the validations is 100%. These sources were assigned to three groups: other farmers, agricultural institutions (interpersonal sources), and media.

The study examines the relationship between farmers' attitudes toward interpersonal sources and the factors that influence these attitudes with a regression model. The independent variables in the model are the following: being an organic or conventional farmer and having a low or high degree of innovativeness. In addition, the variables of age, education, farm size, and share of farm income are introduced into the model as controlling variables. The continuous dependent variable represents the sum of importance rate (%) cited by farmers for interpersonal sources.

Similar to the degree of innovativeness model for conventional farmers, the study conducted OLS regression analyses when testing the hypotheses on the importance of interpersonal information sources. The OLS models depict the relationship between a dependent variable and a collection of independent variables. The value of a continuous dependent variable is defined as a linear combination of the independent variables, plus an error term:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \epsilon.$$

While  $\beta_s$  show regression coefficients,  $X_s$  provide the column vectors for the independent variables, and  $\epsilon$  is a vector of errors of prediction (25). The regression coefficients are interpreted as the change in the value of dependent variable  $Y$  associated with a unit increase in an independent variable, and other independent variables are constant.

### RESULTS

The main objective of the study is to examine whether interpersonal ties' characteristics are associated with the number of innovations adopted by farmers (innovativeness). Table 3 depicts the relationship between strong interpersonal ties (friendship and affiliation ties) and farmers' innovativeness. In order to observe the differences between organic and conventional farmers, the model is tested for



**Table 3.** Influence of Interpersonal Ties on Total Innovation Activity

Interpersonal Ties	Total Innovation Activity					
	Entire Sample		Organic Farmers		Conventional Farmers	
	Coef.	$\chi^2$	Coef.	$\chi^2$	Coef.	$\chi^2$
Strong friendship ties	1.049*	0.069	0.757**	0.555	1.802*	0.106
Strong affiliation ties	0.556	0.558	0.216	0.366	1.333**	0.245

While strong friendship ties represent farmers that have a small network size and communicate with high frequency, strong affiliation ties represent farmers that are attached to at least one agricultural organization and frequently participate in agricultural organization events.

Significance levels of regression coefficients: \* $p < 0.05$ , \*\* $p < 0.1$ .

three farmers' samples: organic, conventional, and the entire (organic + conventional) sample.

The results show a positive significant relationship between strong friendship ties and total innovation activity for all tested samples. This result implies that there is no support for hypothesis 1 (H1: Having strong friendship ties indicates lower innovativeness of farmers). Additionally, we observe a positive significant relationship between strong affiliation ties and innovativeness of conventional farmers. In general, hypothesis 2 (H2: Having strong affiliation ties indicates higher innovativeness of farmers) has been verified for the sample of conventional farmers but not for the organic and entire farmers' samples.

In Table 3, with respect to the entire sample results column, the regression coefficient shows that the farmers, on average, adopt 1.04 innovations when farmers have strong friendship ties (coefficient = 1.049,  $p < 0.05$ ). Additionally, significant chi-squared test (0.069) for strong friendship ties suggests that the presence of strong friendship ties influences innovativeness. However, the strength of this relationship is not significant for affiliation ties. These results raise the question of whether interpersonal network ties have an influence on total innovation activity. In the following part, therefore, we offer further analysis of the interpersonal communication network variables.

### Results From Degree of Innovativeness

Table 4 shows the results of the regression models with degree of innovativeness as the dependent variable within the entire sample (Analysis I), only for organic farms (Analysis II), and only for the

conventional farms sample (Analysis III), respectively. As opposed to Analyses I and II, in Analysis III, due to the high number of missing values for friendship ties' variables and the low sample size, the logit model failed to explain the predictors. Thus, the study provides results of the OLS regression model for the conventional farmers' sample.

The results of the logit analysis for all farmers and organic farmers, including estimates of explanatory variables and corresponding standard errors, appear in the first and second columns. The last column shows the OLS regression coefficient and standard errors for the predictors of explanatory variables for the conventional farmer sample. In these three analyses, the dependent variable is a dichotomous variable (low/high innovativeness). Tested predictors were treated as significant when the value was  $p < 0.10$ .

All analyses were tested for multicollinearity with a variance inflation factor (VIF) and pairwise correlation coefficient between explanatory variables (31). No problems were reported except for a high correlation between share of farm income and farm size variables in the organic farmer sample. This problem was solved by eliminating the farm income variable from Analysis II. In Analyses II and III, the explained variances of  $R^2$  adjusted are 0.52 and 0.71, respectively. This quite high value indicates that in these two models, the employed variables fit well to the model.

In Analysis I, the logistic probability model serves mainly to answer the question of whether friendship and affiliation ties influence the high degree of innovativeness and to assess if other control variables, such as farms' and farmers' characteristics, are significant factors (Table 4). The model results show that high innovativeness is significantly influenced

**Table 4.** Results of Regression Analysis With Degree of Innovativeness as Dependent Variable

Explanatory Variables	Analysis I	Analysis II	Analysis III
	Entire Sample	Organic Farmers	Conventional Farmers
Farmers' and farms' characteristics			
Age	-1.961* (0.966)	-0.027 (1.22)	-0.020** (0.01)
Education	-0.125 (0.146)	0.057 (2.292)	0.043 (0.051)
Farm size	0.001 (0.001)	-0.010 (0.011)	0.001** (0.000)
Farm income	-0.596** (0.328)	-	-0.189 (0.124)
Soil quality	0.003 (0.368)	-0.162 (0.756)	0.352 (0.137)
Year of experience on OF	-	0.395** (0.168)	-
Organic farm	0.012 (0.73)	-	-
Friendship ties			
Communication frequency	1.196** (0.719)	4.292* (2.163)	-0.179 (0.207)
Network size (connectedness)	-0.709** (0.374)	-1.553** (0.86)	-
Age	-	-0.312* (0.15)	-
Education	-	-0.667 (0.473)	-
Innovativeness	-	-0.631 (0.465)	-
Affiliation ties			
Membership status	2.703* (1.192)	5.087 (3.26)	0.675* (0.230)
Participation frequency	-0.333 (0.719)	-2.260 (2.26)	0.279 (0.187)
Constant	2.144 (2.792)	20.404 (14.583)	-0.578 (1.169)
Prob> $\chi^2$ ; Prob> <i>F</i>	0.095	0.008	0.055
<i>R</i> <sup>2</sup> adj.	0.198	0.516	0.705
<i>N</i>	70	45	19

Standard deviations are given in parentheses. Analysis I and II columns represent the results of logit regression and Analysis III column gives ordinary least squares (OLS) linear regression results.

Significance levels: \* $p < 0.05$ , \*\* $p < 0.1$ .

by age, share of farm income, communication frequency, and network size. The negative sign of estimates for the dichotomous age variable confirms that farmers less than 40 years old are more likely to be in the high degree of innovativeness cluster. The large share of farm income is found to be significantly less favorable for innovativeness than the moderate and low share of farm income categories. Regarding interpersonal network ties, variables such as communication frequency and being a member of a minimum of one agricultural association, as expected in hypotheses 3 and 6, increase the probability of farmers possessing high innovativeness. These two hypotheses have been verified for the entire sample because the explanatory variables of communication frequency and being attached to an agricultural organization demonstrate significant influence on the surveyed farmers. With respect to network size (connectedness), contradictory to our hypothesis 4, a large network size is found to be significantly less favorable for innovativeness of a farmer than smaller network sizes. We have rejected

hypothesis 5 (H5: Farmers who participate in agricultural organizations' events more frequently are more likely to be highly innovative). The explanatory variable of participation frequency is found not to be a significant determinant for explaining the degree of innovativeness for all three study samples.

In Analysis II, the logistic model for the organic farmer sample indicates that being highly innovative is significantly influenced by the experience of organic farming practices and communication frequency regarding agricultural issues (Table 4). The positive sign of the estimate for the communication frequency variable confirmed the hypothesis 3, which stated that farmers who communicate with their peers more frequently are more likely to innovate. Similar to entire sample estimation results, a high network size negatively influences innovativeness; thus, we also reject hypothesis 4 for the organic farmer sample. Farmers who communicate with older friends demonstrate a lower probability of innovativeness than those farmers who communicate regularly with younger friends.

The OLS regression results of Analysis III show that age and farm size are the significant variables for explaining the degree of innovativeness of conventional farmers. We could interpret the negative sign for the age variable as farmers in the younger age group being more likely to implement a higher number of innovations than farmers in the older age group. The positive sign of the estimate for the farm size implies that conventional farmers with larger farms are more likely to adopt a high number of innovations than those with smaller farms. Regarding the influence of interpersonal network actors, communication frequency with other farmers is not found to be a significant determinant for conventional farmers' innovativeness. Thus, hypothesis 3 is rejected for the conventional farmer sample. Furthermore, similar to Analysis I, hypothesis 6 is verified for conventional farmers. Members of at least one agricultural association are more likely to adopt a high number of innovations than nonmembers.

**Results From Information Sources**

Table 5 shows the results on farmers' valuation (%) of interpersonal and media sources. Mean values

and *t* test results are presented within the division of two study samples: organic–conventional farmer samples (Analysis IV) and low–high degree of innovativeness samples (Analysis V).

In Analysis IV for the organic–conventional farmer samples, other farmers are identified as the most important information source for both the organic and conventional farmers (25% for organic and 20% for conventional farmers) compared to the other 12 examined sources. For organic farmers, seminars are appreciated more as information sources (18%) than by conventional farmers (8%). Both organic and conventional farmers value the importance of agricultural organizations with an average of 12%. Conventional farmers assign a significantly higher importance rate to magazines, broadcasts, and the Internet relative to organic farmers.

In Analysis V, the low–high degree of innovativeness samples, we observe that for low-innovative farmers, agricultural organizations such as associations, chambers of agriculture, and research institutes are cited with a significantly higher importance rate (14%) compared to highly innovative farmers

**Table 5.** Farmers' Mean Rating (%) of Interpersonal and Media Sources (Total Equal to 100%)

	Analysis IV			Analysis V		
	Organic Farmers	Conventional Farmers	<i>t</i> Test	High Innovativeness	Low Innovativeness	<i>t</i> Test
<b>Interpersonal sources</b>						
Other farmers	25.13	21.78		21.85	25	
Agricultural organizations	11.86	12.50		6.35	14.15	*
Research institutes	4.17	4.64		7.60	2.77	*
Extension agents	5.57	5.00		4.75	5.64	
Seminars	18.59	9.28		17.20	16.02	
<b>Media sources</b>						
Brochure	6.73	4.50		5.10	6.62	
Book	10.34	6.64		9.90	9.21	
Magazine	7.26	15.28	*	12.40	7.32	**
Broadcasting	0.19	2.64	*	1.10	0.53	
Radio	0.00	0.21	**	0.15	0.00	
Advertisement	2.73	6.14	**	5.65	2.45	**
Site visit	6.51	4.42		6.45	5.79	
Internet	0.67	4.07	*	1.10	1.49	
Other sources	0.19	2.85	*	0.40	0.89	
<i>N</i>	25	15		20	47	

The sources of agricultural organizations represent associations, chambers of agriculture, state institutes, and agricultural offices. The sources of extension agents represent private consultation and advice from the supplier. In Analysis V, farmers with a low degree of innovativeness represented by total innovation activity is ≤2; farmers with a high degree of innovativeness represented by total innovation activity is >2.

Mean value results given with two-sample *t* test with significance levels: \**p*<0.05 and \*\**p*<0.1.

(6%). Furthermore, relative to farmers in the low-innovativeness cluster, the mean rating for research institutes is significantly higher for farmers in the high-innovativeness cluster.

In order to examine the relationship between the importance of interpersonal sources for farmers and the factors that influence it, we use the OLS regression model. In Table 6, Analysis VI shows the results of the interpersonal information sources model within the entire sample. As explanatory variables, the model uses the following characteristics for farmers: age, education, degree of innovativeness, being an organic farmer, and farm form are all dichotomous. The continuous dependent variable represents the sum of importance rate (percentage) cited by farmers for interpersonal sources (other farmers and agricultural organizations). Similar to previous regression models, tested predictors were treated as significant when the  $p > |t| < 0.10$ .

In Analysis VI, the regression model shows that the explanatory variables age, education, degree of innovativeness, farm size, and being an organic farmer are strong indicators for farmers' valuation of an interpersonal information source's importance.

The regression coefficient shows that the importance rate for interpersonal sources decreases if

the farmer's age is above 40 (coefficient =  $-21.2$ ,  $p < 0.05$ ). A possible explanation for this result is that farmers older than 40 already have knowledge and experience on farming practices and do not value interpersonal sources as highly as younger farmers do. Farmers educated more than 17 years consider interpersonal sources less important than those educated less than 17 years (coefficient =  $-9.3$ ,  $p < 0.01$ ). Contrary to our hypothesis 7 (H7: Highly innovative farmers value interpersonal information sources more than less innovative farmers), farmers who are in the high-innovativeness cluster assign less importance to interpersonal sources than those who are in the low-innovative cluster (coefficient =  $-13.4$ ,  $p < 0.01$ ). Furthermore, the cited importance rate for interpersonal sources is positively related with farm size (coefficient =  $0.019$ ,  $p < 0.01$ ). Finally, the positive sign of the coefficient for the organic farmer variable confirms that organic farmers value interpersonal sources more than conventional farmers (coefficient =  $12.315$ ,  $p < 0.01$ ).

## DISCUSSION AND IMPLICATIONS

The main objective of this article is to examine the influence of friendship ties (ties to other farmers) and affiliation ties (ties to associations) on farmers' innovativeness. Logit and OLS regression models were used to examine whether network ties' structure and strength influence farmers' innovativeness. These models were also used to investigate the importance of information gathered by farmers from interpersonal sources. The study compares the results of organic and conventional farmer samples to increase our understanding of the innovation adoption behavior in different network structures.

In this regard, the study contributes to a better understanding of the link between network ties and innovation adoption behavior of farmers and to a better understanding of the importance of interpersonal information sources for farmers. This in turn may help to adjust policy measures aiming to support farm enterprises' innovativeness.

Overall, our research results suggest that in addition to farms' and farmers' characteristics, interpersonal networks influence farmers' innovativeness. The presented findings of innovation adoption rates

**Table 6.** Analysis VI: Results of OLS Regression Analysis With Importance of Interpersonal Sources as Dependent Variable

Explanatory Variables	Entire Sample		
	Coef.	SE	$p >  t $
Farmers' characteristics			
Age	-21.266	6.976	0.004
Education	-9.372	5.149	0.075
Degree of innovativeness	-13.414	5.939	0.028
Farms' characteristics			
Farm form	8.373	5.412	0.128
Farm size	0.019	0.010	0.052
Farm income	6.672	6.528	0.312
Soil quality	0.665	2.655	0.803
Organic farmer	12.315	6.551	0.066
Friendship ties			
Communication frequency	0.121	0.115	0.296
Network size (connectedness)	-0.743	2.169	0.733
Affiliation ties			
Membership status	3.028	6.912	0.663
Participation frequency	-0.485	2.534	0.849
Constant	57.994	13.951	0.000

Prob  $> F = 0.014$ ,  $R^2$  adj. =  $0.365$ ,  $N = 64$ .

with respect to the strength of farmers' interpersonal ties have shown that there is a positive significant relationship between strong friendship ties and a farmers' innovativeness (both by organic and conventional farmers). This finding implies that compared to having a large friendship network where actors interact less frequently, having a small friendship network with frequent interaction strengthens farmer innovativeness.

Regarding the findings that emerge from the degree of innovativeness regression model for the entire sample, for the friendship ties variables, we observe the positive influence of communication frequency (on agricultural issues) with other farmers on the innovativeness of farmers. Additionally, the degree of farmer innovativeness decreases with the increasing network size (connectedness) of the farmer. These results are consistent with the strength of interpersonal tie findings, which state that having a small friendship network with frequent interaction strengthens farmer innovativeness. The negative influence of network size (connectedness) is contrary to the hypotheses of Warruber and Moul, who assume a positive influence of network connectedness on adoption behavior as the number of information sources for new or novel farming ideas increase (49). In contrast to these authors, in our study, we consider the network size of friends who are farm managers, not the friends from other sectors and kinship network actors.

In the degree of innovativeness regression model for the entire sample, for the affiliation tie variables, being attached to an agricultural organization was found to be a significant determining factor explaining innovativeness. The study by Jagger and Pender on innovation diffusion in rural areas showed similar results: farmers' participation in organizations positively influences the adoption of innovations (27). High participation frequency in agricultural association events, which indicates a higher level of social capital, does not predict the innovativeness of either organic or conventional farmers in our model (6,44).

A fairly different picture is found with respect to the degree of innovativeness model for organic and conventional farmer samples. Years of experience with organic farming practices, high communication frequency, a small network size, and a friendship network with younger actors were found to be

significant positive determinants for the innovativeness of organic farmers. These results confirm that friendship ties positively influence the innovativeness of organic farmers. In the group of conventional farmers, communication frequency with other farmers does not predict higher innovativeness of farmers, and thus contradicts the findings by Monge et al., which state that farmers who have frequent conversations about technological changes in their network are more likely to adopt new knowledge and technology than other farmers (32). Membership in at least one association is positively interconnected with a high level of innovativeness for conventional farmers.

From the degree of innovativeness regression models' findings, we derive the following recommendations. First, organic farms that want to be more innovative should improve cooperation and relations with close friendship ties within their narrow network, and conventional farms should become more engaged with agricultural organizations. Second, designers of programs for supporting innovativeness in rural areas can learn from the results, for example, that it may be useful for extension services to create discussion groups among farmers. Such groups can encourage farmers to share their experience with different innovations. Similar groups were already established to improve farm businesses and farm profitability, for example, in Ireland, New Zealand, and the UK (1,8).

Further results show that significant differences exist between organic and conventional farmers in the perception of information received from media sources. The importance of sources, such as magazines, broadcasts, and the Internet, was rated significantly higher by conventional farmers than organic farmers. Institutions and organizations can use these findings while choosing the most effective communication channels for this farmers group. For high-low innovative samples, mean rating results show that highly innovative farmers place importance on information from research institutes more and information from agricultural organizations (including associations, chambers of agriculture, state institutes, and agricultural offices) less than less innovative farmers. To support the innovativeness of farmers, agricultural organizations should place more emphasis on providing farmers with

information that comes directly from research. This could be accomplished by organizing meetings with researchers or by spreading information from research through electronic or printed media such as newsletters.

Finally, the regression model examining the factors that influence the validation of interpersonal sources by farmers suggests that factors such as age, education, farm size, and innovativeness were important for explaining the perceived importance of interpersonal sources. These results indicate that during the communication strategy, information providers need to consider factors that influence farmers' information search behavior. For example, for the marketing communication strategy, it is important to understand characteristics of farmers that influence their attitudes toward information sources. As interpersonal sources are relatively unimportant for the old age group in our model, agribusiness marketers should use different interpersonal communication channels for the two different age groups.

As a concluding point, we would like to emphasize that instead of covering the whole range of human complexity, this article studies the influence of certain factors on adoption behavior. We believe that our results contribute to a better understanding of the interdependencies that exist between farmers' information and innovation adoption behavior and thus, support the development of strategies that encourage more effective information distribution.

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# Who buys from farmers' markets and farm shops: The case of Germany

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## Keywords

Direct marketing, farmers' markets, farm shops, consumer behaviour, local food, ordered logit regression.

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## Abstract

In this article, we analyze the influence of sociodemographic factors and consumer attitudes toward direct marketing products and sources (outlets) on the frequency of buying food from farmers' markets and farm shops. By conducting an intercept survey with pedestrians in 2011 and 2012, we interviewed a total of  $n = 550$  consumers. The target regions of the study were the Eastern German federal states. The study uses two ordered logit regression models to investigate consumers' shopping behaviour at farmers' markets and farm shops separately. We find that different factors significantly influence consumers' buying behaviour at the two direct marketing outlets. Specifically, both a more favorable view toward the freshness of directly marketed foods and the intention to support local producers are positively related to consumers' purchase frequency from farmers' markets. In contrast, consumers' purchase frequency from farm shops is significantly influenced by their perception of the cost of the products, confidence in food producers of directly marketed products, perception of the safety of the food and perception of the accessibility of farm shops. The study results indicate that considering consumer behaviour separately for different direct marketing channels for food rather than considering the entire category of local food outlets may provide new and valuable insights.

## Introduction

In Germany, as in other countries, it was historically common for farmers to sell their products directly to consumers. However, after the Second World War, the direct marketing approach to buying and selling food products almost disappeared. With the aim of increasing revenues, direct marketing began to reemerge in the 1980s (Sommer, 1995). Although no official statistics are available regarding the current number of German farmers involved in direct marketing, it is estimated that approximately 30 000 to 40 000 farms, corresponding to approximately 6–8% of German farms, sold their production directly to consumers in 2013 (BMELV, 2013). Because of the historic division in Germany, the structure of farms in Eastern and Western Germany remains considerably different. For example, in the Western German state of Bavaria, a total of 94 000 farms cultivate, on average, 33 ha of agricultural land and the number of direct-selling farmers is estimated to be approximately 3500 (3.7%) (STMELF Bayern, 2013). Given the number of consumers, in Bavaria, there are approximately 3580 consumers per farm. In the Eastern German state of Saxony, 6100 farms currently cultivate an average of 149 ha of agricultural land, and the number of direct-selling farmers was approximately 500 in

2013 (8.2% of Saxony farms). Given the number of consumers in Saxony, this leads to approximately 8300 consumers per farm (Direktvermarktung in Sachsen e.V., 2013). In conjunction with the difference in the availability of farm shops in the Eastern and Western German federal states, higher income and lower unemployment rates in the West may affect consumer behaviour toward directly sold food. While a few studies have investigated consumer behaviour toward directly sold food in Western Germany (Zenner *et al.*, 2004; Wirthgen, 2005), to our knowledge, no study has conducted such an investigation in Eastern Germany.

Internationally, the growing market for local products has engendered increasing scholarly interest in consumers' perceptions of and attitudes toward direct marketing, as reflected by the increasing number of published studies on this topic, especially in North America (e.g., Thilmany, Wirthgen, 2005; Bond *et al.*, 2006; Zepeda and Li, 2006; Bond and Bond, 2008; Cranfield *et al.*, 2012; Adekunle *et al.*, 2013) but also in the EU (e.g., Wirthgen, 2005; Roininen *et al.*, 2006; Chambers *et al.*, 2007; Rocchi *et al.*, 2011; Carey *et al.*, 2011). However, in the EU, such consumer studies remain rare, while the differences between EU countries regarding direct marketing and consumer behaviour remain large (Vecchio, 2011).



Some studies on consumer preferences for directly sold food concentrate on a specific distribution channel, such as farmers' markets. Directly sold food is generally considered local food; however, food does not have to be sold directly by farmers to be considered local. Thus, some studies that investigate the effects of attitudinal and sociodemographic factors on consumers' likelihood of buying local food neglect the effect of distribution channels. This study contributes to the literature by investigating the effect of distribution channels and comparing the influence of sociodemographic characteristics and perceived product attributes on consumers' purchase frequency in two market outlets: village or city farmers' markets and farm shops, which are located on farms. We focus on these distribution channels because other direct marketing channels, such as box schemes or farm stands, are rarely used in the considered region. To contribute to the understanding of how consumers' perceptions influence their decision to buy food directly from farmers via different distribution channels, we investigate the following two research questions: Which perceived attributes and sociodemographic factors determine consumers' frequency of buying food products from farmers' markets and farm shops? Do the perceived attributes of products and the sociodemographic characteristics that influence consumers' buying behaviour differ between farmers' markets and farm shops? To answer these questions, we apply two ordered logit regression models on data collected in Eastern Germany. In contrast to other similar studies, instead of quantity of food, we use purchase frequency as the dependent variable. However, we assume that perceived attributes and sociodemographic factors influence the frequency and value of food purchased directly from farmers in very similar ways.

The article is structured as follows: After describing the study's theoretical background, the survey and methodology are detailed. The results are then presented, and a discussion and conclusions are provided to close the paper.

## Background

### Defining direct marketing and local food

Direct marketing (direct selling) can be defined in multiple ways. Our study focuses on direct marketing in a narrow sense, where producers sell their ready-to-eat products directly to consumers. In Germany, the most common distribution channels for direct marketing are farmers' markets and farm shops. These channels are also common supply chains through which local food products are sold in the US (Feagan *et al.*, 2004; Selfa and Qazi, 2005; Ilbery and Maye, 2006; Bond *et al.*, 2008). Some studies include more direct marketing channels, such as farmers' markets, Community Supported Agriculture and farm stands and examine these channels collectively as 'local food' (e.g., Zepeda and Li, 2006).

Local food products are generally distinguished from other foods by the distance between the place of production and the final market. US studies have used a distance ranging anywhere from 30 to 150 miles to define local food (Selfa and Qazi, 2005; Chambers *et al.*, 2007). Moreover, some studies define local food as food grown within a country or state, while other authors doubt whether political boundaries are the best

delineation to define local food (Zepeda and Leviten-Reid, 2004; Darby *et al.*, 2008). In the study by Zepeda and Leviten-Reid (2004), most US consumers defined local in terms of driving time instead of political boundaries.

In conclusion, local food can be understood as a broad category comprising food products from different marketing distribution channels, such as farmers' markets and farm shops. Thus, in the cited studies on consumer behaviour toward local food, the effect of distribution channels is not considered.

### Consumers' attitudes toward directly marketed food

Attitudinal and behavioural characteristics are generally better predictors of local food buying behaviour than demographic characteristics (Zepeda and Li, 2006). In the following, we identify attributes from the literature that have been found to determine consumers' buying behaviour with regard to local and directly marketed food products. Two main branches of literature exist: the first branch focuses on local food in general, whereas the second branch considers only selected distribution channels, in most cases farmers' markets (Table 1). The studies we reviewed on consumer behaviour toward local food do not consider the possible differences in consumers' characteristics and attitudes between different distribution channels. We selected papers that are most relevant for our study with respect to the considered distribution channels and geographical location. Therefore, this overview includes studies in the two main branches of the literature mentioned above from Europe and the US.

The results of previous studies typically indicate that consumers positively associate attributes related to *taste* and *freshness* with local food products (La Trobe, 2001; Selfa and Qazi, 2005; Chambers *et al.*, 2007; Feagan and Morris, 2009; Carey *et al.*, 2011). Findings from a focus group discussion carried out by Chambers *et al.* (2007) suggest that *perceived prices* rather than objective prices influence consumers' decision not to buy local food products. Furthermore, empirical data suggest that the prices of local food products are perceived to be high (Roininen *et al.*, 2006; Chambers *et al.*, 2007).

Other empirical evidence indicates that consumers perceive a key benefit of local food to be that they know 'where the food came from' (Roininen *et al.*, 2006). The literature further suggests that consumers associate local food products with *greater transparency* (Jones *et al.*, 2004). This assumption is supported by the results of a study in Germany based on a rank-ordered logit analysis showing that consumers mistrust conventional food from elsewhere (Wirthgen, 2005).

A number of studies have confirmed that *convenience of location* is of high importance for consumers' choice of outlet (e.g., Bond *et al.*, 2006; Zepeda, 2009; Adekunle *et al.*, 2013). Other studies show that consumer decisions to buy food from local farmers are driven by the *willingness to support* the farmers and, thus, the region (Eastwood *et al.*, 1999; Feagan *et al.*, 2004; Zepeda and Leviten-Reid, 2004; Bond *et al.*, 2006; Feagan and Morris, 2009). Consumers often associate *transportation distance* with fuel consumption, and environmentally conscious consumers may thus be more inclined to buy locally (Zepeda and Li, 2006; Seyfang, 2006).

**Table 1** Selection of studies on factors influencing consumer behaviour toward local food (or farmers markets) in different regions

Scholar	Year	Research topic	Area
Bond, Thilmann, and Bond	2006	Fresh food outlet selection drivers	US
Carey <i>et al.</i>	2011	Farmers' market	Scotland
Chambers <i>et al.</i>	2007	Local food	UK
Cranfield, Henson, and Blandon	2012	Local food	Canada, Guelph
Eastwood <i>et al.</i>	1999	Farmers' market	US, Tennessee
Feagan and Moris	2009	Farmers' market	Canada
Feagan <i>et al.</i>	2004	Farmers' market	Canada, Ontario
Jones, Comfort, and Hillier	2004	Local food	UK
La Trobe	2001	Farmers' markets	UK, Kent
Roininen, Arvola, and Lahteenmaki	2006	Local food	Finland
Selfa and Qazi	2005	Local food	US, Washington state
Wirthgen	2005	Regional food	Northern Germany
Zepeda and Leviten-Reid	2004	Local food	US, Wisconsin
Zepeda and Li	2006	Local food	US
Zepeda	2009	Farmers' market	US

## Data collection and methodology

### Data collection

The data were collected using an intercept survey with a structured questionnaire. Standardized face-to-face interviews were administered to pedestrians in May and June of 2011 and 2012. Trained students with knowledge of agricultural marketing acted as interviewers after they received a 4-hour long training session on how to conduct the survey given by two of the co-authors of this study. The target regions of the study were the Eastern German States of Saxony, Saxony-Anhalt, and Thuringia. Participants were approached on the street. In line with Zenner *et al.* (2004), stratified sampling using the criteria of gender (goal: 70% female/30% male) and age (goal: 30% of participants between 18 and 35 years, 40% between 36 and 60 years and 30% above 60 years) was conducted to approximate the typical German grocery shopper. A total of  $n = 550$  study participants were interviewed.

The questionnaire comprised three essential parts. The first part contained questions on the study participants' grocery shopping behaviour. The second part then focused on consumers' attitudes toward directly marketed food. All answers in the second part were given on a seven-point Likert scale. Finally, the third part collected sociodemographic data. To ensure the quality and comprehensibility of the questions, a pre-test was carried out. Subsequently, some of the questions were refined and improved.

### Methodology

In the literature, research by Warshaw and Droge (1986) on consumer choices links discrete choices to attitude theory in economic psychology. Furthermore, in consumer behaviour studies, logistic (or probit) regression is often applied in contexts where consumers choose from a set of alternatives (Thilmann *et al.*, 2008; Keeling Bond *et al.*, 2009).

In our study, two ordered logistic regression models are used to estimate the influence of sociodemographic characteristics and attributes as perceived by consumers on their purchase

frequency from two direct marketing channels: farmers' markets and farm shops.

The dependent variable, consumers' purchase frequency from the two direct marketing channels, is measured on a five-point scale ranging from 'never' to 'weekly'. In the mapping process, the following set of consumer alternatives is used:

$$\begin{aligned}
 y_i &= 0 \text{ if } y^* \leq 0, \text{ nonbuyer} \\
 &= 1 \text{ if } 0 < y^* \leq \mu_1, \text{ less frequent buyer} \\
 &= 2 \text{ if } \mu_1 < y^* \leq \mu_2, \text{ monthly buyer} \\
 &= 3 \text{ if } \mu_2 < y^* \leq \mu_3, \text{ bimonthly buyer} \\
 &= 4 \text{ if } \mu_3 \leq y^*, \text{ weekly buyer}
 \end{aligned}$$

Given such discrete alternatives, the larger values are assumed to correspond to 'higher' outcomes. The ordered logit model offers a data-generating process for this type of discrete choice-dependent variable (Greene, 2003). The main objective of an ordered logit regression analysis is to predict the choice probabilities in response to changes in several independent variables.

As independent variables that influence consumers' buying decisions, we use consumers' perceptions of the attributes of direct marketing products and their sources. Product and source attributes as perceived by consumers are measured on a seven-point Likert scale, where respondents indicated their opinion regarding a statement on a scale ranging from strongly disagree to strongly agree. The internal consistency of the used 7 attribute statements measuring consumers' perceived product and source attributes in the ordered logit models is calculated using Cronbach's alpha. This procedure is in line with most empirical analyses estimating the reliability of a set of question items (Cronbach 1951; Henson, 2001). In our case, Cronbach's alpha is 0.716, indicating that the scales had acceptable internal reliability. A coefficient greater than 0.70 was considered acceptable (Hair *et al.*, 1988; Goyal and Singh 2007). In addition, the sociodemographic variables of sex, age, education, population of residence and household size are entered into the model as control variables. The underlying model process is expressed as follows:

$$y^* = \beta_0 + \beta_1 X_{\text{sex}} + \beta_2 X_{\text{age}} + \beta_3 X_{\text{education}} \\ + \beta_4 X_{\text{population of residence}} + \beta_5 X_{\text{household size}} \\ + \beta_6 X_{\text{perceived attributes}} + \varepsilon$$

where  $y^*$  is the unobserved dependent variable. We run two separate ordered logistic regression models to estimate the influence of the examined factors with respect to each of the direct marketing channels, farmers' markets and farm shops.  $X$  is the vector of the independent variables, and  $\beta$  (beta) is the vector of regression coefficients that we aim to estimate. The beta coefficients are the ordered log-odds (logit) regression coefficients that enable the interpretation of the ordered logit model. The sign of the estimated ordered logit model parameters can be interpreted directly. A positive sign indicates that the set of alternative probabilities shifts to higher categories when the explanatory variable increases (Takeshi, 1994). The standard interpretation of a beta coefficient is that with a one-unit increase in the independent variable, the level of the dependent variable is expected to change by its corresponding regression coefficient in the ordered log-odds scale. This change occurs while other variables remain constant in the model (Bruin, 2006).

For our statistical analysis, we use the statistical software package STATA. Both regression models (one for farmers' market buyers and one for farm shop buyers) are tested for multicollinearity by calculating Pearson's correlation coefficients for each pair of independent variables. Variables with coefficients showing correlations more than 0.5 (5 items) are eliminated from the model. Furthermore, multicollinearity is tested using a variance inflation factor (VIF). The results show that the mean VIF values are between 1.05 and 1.68 for both the farmers' market and farm shop models and are thus under the threshold of 10 (Chatterjee and Hadi, 2006; O'Brien, 2007). Therefore, we conclude that there is no serious multicollinearity problem between the explanatory variables used in both models.

Because of missing values, the number of observations for the ordered logit regression model is reduced from 550 to 517. In the section that follows, the results from the two regressions, including coefficient estimates with  $P > |z|$  test significance levels, standard errors and odds ratio, are presented.

**Table 2** Consumers' ( $n = 550$ ) perceived attributes on direct marketing products and sources (%)

	Strongly disagree				Strongly agree			
Freshness (fresher directly from farmers)	2.88	1.62	5.05	10.27	12.07	28.65	39.46	
Taste (better directly from farmers)	4.14	3.06	5.59	18.38	16.76	24.50	27.57	
Price (food directly from farmer too expensive)	17.30	13.87	13.33	20.72	13.15	9.37	12.25	
Confidence in food safety (higher in direct marketing products)	7.04	6.50	6.68	15.88	16.79	22.92	24.19	
Where produced (important to know)	6.67	6.85	11.71	14.41	21.62	16.76	21.98	
How produced (important to know)	6.65	6.12	7.91	14.75	15.83	21.22	27.52	
Confidence in animal welfare (higher in direct marketing products)	7.22	7.58	5.78	15.16	17.15	21.66	25.45	
Confidence in food sold by farmer (higher than other sources)	6.82	6.06	7.01	15.72	17.23	23.48	23.67	
Confidence in small farmers' products (higher than large farms)	8.52	3.6	7.39	12.31	13.45	27.65	7.08	
Convenient location (it is inconvenient for me to buy directly from farmer)	28.78	14.21	10.97	14.57	7.91	8.45	15.11	
Support local farmers (it is important to me)	7.37	6.12	6.65	14.39	12.05	18.88	34.53	
Short transportation (I prefer products with short transportation distance)	9.55	9.37	7.03	12.79	13.15	16.22	31.89	

Source: Own calculation from Direct Marketing Survey, East Germany, 2011 and 2012.

## Results

In this section, we present the results of the analysis in two parts. First, we examine consumers' perceived attributes associated with food purchased from the selected direct marketing channels. Second, we investigate the influence of these attributes on the consumers' purchase frequency from two direct marketing channels: farmers' markets and farm shops.

### Consumers' perceived attributes

Table 2 provides a detailed overview of the rating results for the 12 statements used to assess consumers' perceptions of the attributes of food products and their sources. The majority of the respondents agree that food purchased directly from the farmer is fresh (approx. 80%) and tastes better than food purchased from other outlets (approx. 69%). We also find that over 60% of the respondents are interested in how and where their food is produced. The data indicate that the main drawback of food purchased from these outlets is not the (perceived) price (35% of the respondents agree that products purchased directly from farmers are too expensive) but rather the difficulty of reaching an outlet selling these directly marketed products. More than half of the respondents disagree with the statement that it is 'very convenient' to buy food directly from farmers.

Regarding whether consumers have higher confidence in foods purchased directly from farmers than in products purchased from other outlets, merely 20% of the respondents have lower confidence in direct marketing products.

The majority of the respondents indicate that they are interested in supporting local farmers and short transportation distances. More than 50% of the respondents agree that they want to support local farmers with their purchases. Furthermore, approx. 26% of the respondents report that they do not prefer their food to be transported over short distances. Social desirability bias cannot be fully excluded from the responses to these statements.

### Results of the ordered logit models

Table 3 presents the results of the ordered logit regression analysis for both the farmers' market model (FMM) and the farm shop model (FSM).

**Table 3** Results of ordered logit models for purchase frequency from two direct marketing channels as dependent variables

	Purchase frequency from farmers' market: Farmers' Market Model (FMM)			Purchase frequency from farm shop: Farm Shop Model (FSM)		
	Coef.	Std. Error	Odds Ratio	Coef.	Std. Error	Odds Ratio
<b>Sex</b>						
Female	0.56**	0.18	1.76	0.07	0.21	1.07
<b>Age Groups</b>						
30–49	0.45*	0.24	1.56	0.69**	0.29	1.99
50–65	1.19**	0.27	3.29	0.41	0.32	1.51
≥ 60	0.99**	0.30	2.69	0.28	0.37	1.32
<b>Education</b>						
High School	0.20	0.23	1.23	0.17	0.28	1.18
University/College	0.06	0.21	1.06	−0.01	0.25	0.99
<b>Population of Residence</b>						
10 000–100 000	0.86**	0.24	2.36	0.04	0.26	1.04
>100 000	0.78**	0.20	2.18	−1.14**	0.24	0.32
<b>Household Size</b>						
2	0.15	0.23	1.17	0.91**	0.32	2.48
3	−0.12	0.28	0.88	0.67*	0.36	1.96
4	0.29	0.30	1.34	0.57	0.37	1.77
>4	0.26	0.38	1.29	1.46**	0.47	4.31
<b>Perceived Attributes of Consumers</b>						
Freshness	0.18**	0.07	1.19	−0.09	0.09	0.91
Price	−0.06	0.05	0.94	−0.10*	0.06	0.90
Confidence in small farmers' products	−0.04	0.05	0.96	−0.11*	0.07	0.89
Confidence in food safety in direct marketing channels	−0.03	0.06	0.97	0.16**	0.08	1.17
Where produced	0.06	0.06	1.06	0.08	0.07	1.09
Convenient location	−0.03	0.05	0.97	0.38**	0.05	0.68
Support local farmers	0.18**	0.05	1.20	0.09	0.07	1.09
Number of observations	517			517		
Prob > chi <sup>2</sup>	0.00			0.00		
Pseudo R <sup>2</sup>	0.07			0.16		

Source: Own calculation from Direct Marketing Survey, East Germany, 2011 and 2012.

Note: Significance levels: \* =  $P < 0.10$ , \*\* =  $P < 0.05$ . Reference (base) categories: "age ≥ 29" for age group, "secondary school or lower level" for education group, "residence < 10 000" for population of residence group, and "household size = 1" for household size group variables.

Because the explanatory variables are evaluated by the same group of consumers, differences between the two ordered logit model estimations are attributable to the difference in the dependent variables between the models, namely, consumers' purchase frequency from farmers' market and consumers' purchase frequency from farm shops.

Looking at the sociodemographic variables in two models, we find that being female is a significant determinant for purchase frequency only in the FMM model. The probability of shopping at farm shops is high for the 30–49 age group. The frequency of purchasing from farmers' markets is significantly higher for shoppers in the 30–65 age group than for younger shoppers. As in the FMM, in the FSM, education level is not a significant determinant for explaining consumers' purchase frequency. Consumers who live in a city with more than 100 000 inhabitants are less likely to frequently buy from farm shops than those who live in less populated locations. Further, consumers who live in places with more than 10 000 inhabitants are more likely to frequently purchase food from farmers markets than those who live in locations within the base category

for population density (up to 10 000 inhabitants). The results show that higher household size is a significantly positive determinant of purchase frequency from farm shops but not from farmers' markets.

For the two studied direct marketing channels, a fairly different picture is found with respect to the influence of consumers' perceived product and source attributes on their purchase frequency. Consumers who perceive food sold by farmers as fresh and who want to support farmers in their region buy more frequently from farmers' markets, while these attributes are not significant determinants of consumers' purchase behaviour in farm shops.

In contrast, consumers' purchase frequency from farm shops is significantly influenced by their perceived price of food in direct marketing channels, confidence in small farmers' products, confidence in food safety in direct marketing channels and convenience of outlet locations. Consumers who agree that products purchased directly from farmers are too expensive are less likely than other consumers to frequently buy food from farm shops. Consumers with higher confidence in food directly

marketed by small family farms rather than by large farms buy from farm shops less often than other consumers. Respondents expressing higher confidence in foods sold directly by farmers than in other foods buy more often from farm shops than other respondents. The significant positive estimate for the convenient location variable implies that an increase in a consumer's perception of the convenience of the location of a farm shop increases the likelihood that the consumer will frequently buy from the farm shop.

## Discussion and conclusion

We use data from a sample of East German food shoppers from 2011 and 2012 to investigate consumers' attitudes and shopping behaviour toward directly marketed food. To offer a first indication of consumers' attitudes toward these products, we use descriptive statistics. To examine differences between farmers' market buyers and farm shop buyers, we employ two ordered logit regressions and separately model the influence of certain factors on consumers' buying behaviour.

The descriptive statistics from the direct marketing survey indicate that the majority of the respondents agree that food purchased directly from farmers is fresher and tastes better than food purchased from other outlets. In general, the respondents are interested in knowing where and how their food is produced, and the majority of the respondents have higher confidence in both the products and the process quality of food purchased directly from farmers than in the products and the process quality of food purchased from other outlets. Furthermore, they want to support local farmers and prefer products with short transportation distances. We nevertheless find that a drawback of directly marketed food products is the perceived difficulty of buying such products: more than 50% of the respondents find it very inconvenient to buy food directly from farmers. In contrast to other studies, we find that in Eastern Germany, frequent farm shop buyers do not have higher confidence in small farms' products than in large farms' products. One may speculate that this is attributable to the good reputation of large corporate farms resulting from Eastern Germany's communist past and the popularity of many of the farm shops run by large corporate farms.

The results of the two ordered logit regressions offer insights into the factors that influence consumer behaviour regarding buying from farmers' markets and farm shops. The main findings can be summarized as follows:

First, we find that if a customer strongly agrees that the food purchased directly from farmers is *fresh*, then that customer will more likely buy more frequently from farmers' markets. This result is in line with a number of studies (La Trobe, 2001; Selifa and Qazi, 2005; Chambers *et al.*, 2007). However, we find that the perceived freshness of directly marketed products is not a significant determinant of consumers' purchase frequency from farm shops.

Second, regarding the influence of consumers' *willingness to support local producers* on their buying decisions, our data confirm results from previous US studies (Eastwood *et al.*, 1999; Zepeda and Leviten-Reid, 2004; Bond *et al.*, 2006) showing that consumers who consider it important to support local producers buy more frequently from farmers'

markets than other consumers. However, we also find that this variable does not significantly influence consumers' purchase frequency from farm shops. This finding is interesting especially given that the results of the study show that farmers' market shoppers predominantly live in places with more than 100 000 inhabitants. Consequently, the results indicate that people from urban areas, who presumably do not have much direct contact with farmers, tend to be more concerned about supporting farmers than consumers who live with farmers in their neighbourhoods.

Third, we find that consumers who agree that products purchased directly from farmers are *too expensive* are significantly less likely than other consumers to buy food frequently from farm shops.

Fourth, higher *confidence in the food safety* of products purchased directly from farmers is significantly associated with a higher purchase frequency from farm shops. However, we find that this variable is not a significant predictor of consumers' purchase frequency from farmers' markets. When shopping at farm shops, consumers can see and check where and, often, how a product is produced. This is not the case when they buy from farmers' markets as such information is provided only by the seller and cannot be easily verified by the buyer.

Fifth, consumers who find it *convenient* to buy products directly from farm shops buy from this source more often than other consumers. This result may explain with our prefindings that inhabitants of populated areas with more than 100 000 inhabitants are less likely than inhabitants of less populated areas to buy frequently from farm shops. As the majority of farm shops in Germany are located in less populated areas, it is more convenient for people living in these areas to reach farm shops. No significant effect of convenience is found in the farmers' market model. This result can be explained by the fact that farmers' markets take place more regularly in cities with more than 10 000 inhabitants and are thus convenient to visit for people living there. Inhabitants living in smaller places very often commute to larger cities to work and, thus, have the opportunity to shop at farmers' markets as well. By comparison, it seems very inconvenient for inhabitants from larger cities to drive to farm shops in a more distant area.

Overall, our findings suggest that consumers do not always act out of pure self-interest, as would be assumed by a homo economicus model of behaviour. Similarly, Thilmany *et al.* (2008) argue that the marginal utility of consuming a good may differ depending on the choice of outlet. Hence, private attributes of source characteristics, such as convenience and travel costs, may influence consumers' decisions, as may non-private, quasi-public characteristics, such as whether products are locally sourced or environmentally friendly. A main result of this study is that farmers' market buyers and farm shop buyers are, in many aspects, different. In this way, our results show that considering consumer behaviour separately for different direct marketing channels for food rather than considering the entire category of local food may provide new and valuable insights in further research. Furthermore, given that consumers' perceptions of product and source attributes differ between the two marketing channels, public communication plans for the two direct marketing channels should integrate different information.

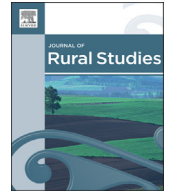
Regarding the implications of our findings for sellers at farmers' markets, our results confirm the common assumption that farmers should focus on advertising the freshness of their food. Furthermore, our findings indicate that sellers should clearly communicate that they or other farmers from the region produce the food they sell. Results also suggest that state agencies may effectively advertise farmers' markets by stressing the potential benefits for the local economy and for local agriculture. For farmers selling their products in farm shops, a promising strategy may be to target consumers in the region, as the convenience of direct marketing channels is a key determinant of consumers' purchase frequency from farm shops. When advertising farm shops in larger cities, farmers should offer information about their prices to counteract urban inhabitants' potential preconceived opinion that prices in farm shops are too high. Moreover, such advertisements should stress that during the visit to a farm shop, consumers can observe the production at the farm, which will increase buyers' confidence regarding the safety of the food and thus increase their willingness to buy from the farm shop.

While our empirical findings are likely important to direct food retailers in East Germany, we are aware that they provide little insight into understanding why an increasing number of people prefer direct food channels. Therefore, the need for further research exploring the reasons why consumers exhibit the behaviour that we observe persists.

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# Migration motivation of agriculturally educated rural youth: The case of Russian Siberia



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## ABSTRACT

The migration of young people from rural areas is common in all agricultural regions of Russia, and Altai Krai, located in southwestern Siberia, is no exception. Out-migration, aversion to working in agriculture and the aging of farmers and farm managers are serious problems that raise questions about who will work in agriculture in the future. This paper aims to investigate factors that affect the decisions of agricultural students from Altai Krai to out-migrate or to return to their rural parental municipalities after finishing their university studies. We conducted a questionnaire survey of students at the Altai State Agrarian University in Barnaul and analyzed their migration intentions using a logit regression model. Migration motivation is studied in relation to personal and family background characteristics, employment expectations and quality of life, with a particular focus on references to agriculture. Our results show that the probability of leaving the parental municipality decreases if i) the respondent's parents support the study of agriculture, ii) the respondent's family owns agricultural land, iii) the respondent intends to work in agriculture, and iv) the respondent believes that it is not difficult to establish one's own business in the parental municipality. Women are more likely than men to leave their rural parental municipalities, and the probability of out-migration increases as respondents' life satisfaction increases. Our findings indicate that agricultural roots in the respondent's family stimulate young university graduates to return home and continue in the family tradition. Some of the factors that push young people, especially women, to out-migrate to cities (such as territorial isolation or the social roles of rural women) may be changed only over a long-term period. The recovery or enhancement of relationships between agricultural schools and agricultural enterprises, access to credits for business establishment and the purchase of agricultural land, and better living conditions in rural municipalities could encourage agriculturally educated youth to remain in rural areas and work in agriculture.

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## 1. Introduction

Youth out-migration is a common feature of most rural areas in both developed and developing countries (Chen et al., 2014; Mihi-

Ramirez and Kumpikaite, 2014). The out-migration of young rural people is often related to participation in higher education and entrance into the labor market (Thissen et al., 2010). Many youth who leave school view the progression to college or university and, accordingly, leaving the home community as a natural process (Stockdale, 2006). Consequently, the propensity to return to the parental municipality after graduation in the city is a selective process that differs according to several characteristics, including the socio-familial, migration and professional trajectories of graduates (Rérat, 2014).

The Russian Federation has long suffered from a demographic crisis whose main features are depopulation, increased mortality and the demographic aging of the population. Russia is

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characterized by a great diversity of territorial demographic situations. The marginal values of key indicators of demographic development in individual regions deviate from the average values in Russia. Until the 1990s, changes in the Russian population (such as changes in the birth rate and population growth) were not a priority in politics and research. Additionally, the interest of both federal and regional authorities in the problems of depopulation, the high mortality crisis and migration flows was negligible (Eremin and Bykov, 2011). The demographic situation in rural areas of Russia has changed in recent decades, largely due to migration from less economically developed regions to more economically developed regions, both within Russia and abroad (Shibaeva, 2012; Krikunov, 2012; Kareva, 2003). Rural depopulation in Russia has been endemic for a long time (Perevebencev, 1990). Between 1960 and 1970, the number of rural inhabitants in Russia decreased by at least 1 million people annually; in some years, the number was even higher. As a result of this process, numerous large cities have appeared (Leyzerovich, 2008). Moreover, nearly all demographic trends that originated during the period of “developed socialism” in Russia have accelerated. One such trend is population growth in cities (Tumanov et al., 2000); in 2013, the share of the population living in cities reached 74%<sup>2</sup> (RSY, 2014). The depopulation trend in rural villages is mirrored by the structure of rural settlements. Between 1989 and 2010, the number of villages with up to 6 inhabitants increased by 60%, and the number of municipalities with more than 5000 inhabitants increased by 32%. In addition, significant changes in the age structure of rural populations occurred between 2006 and 2011. Specifically, the proportion of 10- to 19-year-olds decreased by 3.6%, whereas the proportion of 50- to 64-year-olds increased by 4.9% (RSY, 2014).

It is evident that the decline and aging of rural populations coincide. One of the primary drivers of these processes is the increasing out-migration of rural youth to cities. Russian rural areas (except the rural areas closest to cities) lost 20%–25% of their young people due to migration during the 1989–2002 period; in some regions, these losses reached 40% (e.g., in the Buryatia, Omsk and Tomsk regions) (Karachurina and Mkrtychyan, 2012). The majority of people who migrated from villages to cities between 2007 and 2010 were between the ages of 17 and 29 (Mkrtychyan, 2013). The migration of young people from rural areas is occurring in all agrarian regions in Russia, which has led to the shrinking of this age group in rural villages (Kareva, 2003; Sanzhiev, 2009).

Young people move to cities where institutions of vocational education that provide employment opportunities in the city after graduation are located. Once they receive higher or vocational education, young professionals do not return to rural areas. A low level of wages and unsatisfactory working and living conditions in rural municipalities are unattractive for young graduates. Therefore, the number of graduates of university and secondary vocational educational institutions who return to rural areas is many times lower than the number of people who travel to the cities for professional education. This situation causes problems in producing a specialized workforce in rural areas. The collapse of the Soviet

Union and the aggravation of interethnic relations led to the emergence of new categories of migrants, including refugees and internally displaced persons from the countries of the former Soviet republics. An excessive proportion of unskilled and semi-skilled workers employed on a seasonal or temporary basis has been found in the structure of the flow of foreign labor migrants. The potential to use cheap, unskilled foreigners does not force employers to enhance the quantity and quality of jobs that are attractive to residents of rural regions and young graduates (Karachurina and Mkrtychyan, 2012).

Significant amounts of financial and material resources are invested in national and regional programs to promote agriculture, which is considered the main driving force for rural development. However, government support is not enough to motivate people to work in agriculture (Rybakova, 2013). This aversion to working in agriculture is also evident in our case study area, Altai Krai, which is located in southwestern Siberia on the border of Kazakhstan. Altai Krai is a leading agricultural region in Siberia and the Far East and plays an important role in ensuring food self-sufficiency for the regions. During the Soviet period, Altai Krai received the title of the “granary of Siberia” (Akstat, 2014).

The attractiveness of traditional jobs in agriculture has diminished, which has led to a deficit of experienced workers and specialists in agriculture. From 2005 to 2014, the share of people working in agriculture decreased from 20.7% to 19.2%. The aversion of young people to working in agriculture – and in agricultural specialties in particular – combined with the unwillingness of agriculturally educated people to work in remote agricultural enterprises can have negative consequences for agricultural and agro-industrial businesses, agricultural labor markets and regional development (Shibaeva, 2012; Sergienko et al., 2013; Chekavinskiy, 2012).

In this paper, we focus on the migration motivations of students at the Altai State Agrarian University in Barnaul (the capital of Altai Krai). These students are expected to work in the agricultural sector and, in the best case, to return to the parental municipality. This university is the only agricultural university in Altai Krai, and anecdotal evidence considers its students agricultural specialists who can promote regional agriculture. Agriculture represents an irreplaceable factor for regional development, so we decided to study what this cohort can tell us about migration in the region. The availability of support for this study also played an important role. The main objective of our research is to analyze and evaluate the factors that motivate young people who study agricultural sciences to either migrate from or return to their rural parental municipalities in Altai Krai after finishing their university studies.

Despite the relevance of this issue, we are aware of no previous systematic quantitative studies in the region. This study analyzes the migration motivations of students at the agricultural university with regard to their personal and family background characteristics, employment perceptions, quality of life and relation to agriculture.

This paper is organized as follows: section 2 presents the theoretical background of this study, which provides a context for the development of a questionnaire and the interpretation of the findings; section 3 describes the study area; section 4 presents the data and methodology; section 5 introduces the empirical results regarding the migration intentions of young people and discusses the findings; and section 6 closes the paper with a presentation of conclusions and recommendations for further research.

## 2. Factors that influence the migration decisions of educated rural youth

Much is already known about youths' migration decisions.

<sup>2</sup> The publication of data on migration flows by statistical offices began in the mid-1990s. Because it is very difficult to monitor migration flows between cities, the actual amount of migration can differ from the statistical data by up to 30% (Mkrtychyan, 2013). Another issue that impedes the monitoring of migration flows and of developments in rural-urban settlements is the absence of an official definition of “rural area” in Russia. The Russian internet encyclopedia *Akademik* (2014) states that the main difference between rural and urban settlements is that “the majority of the economically active population in urban settlements is not employed in agriculture” and that “[t]herefore, some villages are larger than cities”. *Akademik* (2014) also notes that the list of settlements with city status changes constantly for three main reasons: they transform into rural settlements, become incorporated into another city or simply disappear from the map.

Garasky (2002) found that non-economic factors play an especially important role in the migration of youth from rural areas, whereas Stockdale (2006) found that economic factors, especially overall high unemployment rates, are decisive factors in the out-migration of youth from the Scottish study area. Garasky (2002) also identified the local economy and labor market as important factors in migration decisions. The findings of Thissen et al. (2010) are consistent with those of the aforementioned studies and note that the migration intentions of young rural people are significantly related to both hard structural factors (i.e., the availability of jobs) and soft cultural factors (i.e., a feeling of being at home). Other factors that have been found to influence migration decisions include quality of life, employment expectations and the characteristics of young people, their homes and the local community environment (Garasky, 2002; Corbett, 2005; Thissen et al., 2010; Mihi-Ramirez and Kumpikaite, 2014).

Based on previous studies and on local conditions in rural areas of Altai Krai, we identified several groups of factors that might influence the motivations of young, agriculturally educated people to migrate from or to return to their rural parental municipalities after completing university: family background, employment expectations, quality of life and personal background. Within these groups, we analyzed factors that indicate interrelationships between the respondents, their family backgrounds, the agricultural roots of their families and their expectations regarding future employment in agriculture, such as parental support for the study of agriculture, respondents' intentions to work in agriculture and family ownership of land.

### 2.1. Family background

The migration motivation of young people is influenced by their parents and other family members. Parents are increasingly highly educated and encourage their children to pursue higher education (Thissen et al., 2010). Bjarnason and Thorlindsson (2006) concluded that parental education enhances the educational experience of their children, which in turn increases the children's migration potential. In a study in Jura, a peripheral rural region in Switzerland, Rérat (2014) showed that graduates' family backgrounds have an important influence on migration; specifically, graduates whose fathers did not attend a higher education institution were more likely to return to Jura. Blackwell and McLaughlin (1998) found that factors such as parental education, parental occupation and family poverty affect educational attainment. Moreover, they determined that these factors affect the educational attainment of young women more than that of young men.

Ermisch and Di Salvo (1997) found that children from high-income families are quicker to leave their parental homes and that parents in high-income families can improve the living conditions of their relocated young adult children using financial resources that had been saved for their children. Several studies have found that students whose mother or father occupies a managerial position demonstrate higher levels of mobility and lower propensities to return to parental homes in rural regions (Belfield and Morris, 1999; Rye, 2011). On the contrary, for the children of successful, self-employed families, the desire to follow the family path can be the key factor behind a decision to stay at home (Corbett, 2005).

Garasky et al. (2001) noted that a large number of siblings residing in the parental home increases the probability that a youth will leave home. In addition, having siblings who previously left the parental household can motivate the youths who remain in the parental home to move because their siblings can provide shared housing.

### 2.2. Employment expectations

Employment prospects in rural communities may be expected to be the most important factor that predicts migration intentions. Employment opportunities in rural areas are often limited; therefore, having occupational aspirations may, to some extent, be coextensive with migration intentions (Bjarnason and Thorlindsson, 2006). Although some young people seek the unskilled jobs that are common in rural areas, many young people aspire to better-paying and more prestigious jobs, which require a formal education that rural areas cannot provide. Generally, women tend to attain higher educational levels than men do and tend to work in services that are only provided in metropolitan areas (Dahlström, 1996; Corbett, 2005). Migration is often motivated by the economic outlook of the local rural area. A developed economy implies higher income, a better labor market, new technologies and other benefits and thus increases migration (Hawthorne, 2010). Most highly educated students leave their parental rural communities because they cannot find a suitable job in these communities. Better employment prospects in urbanized areas can facilitate the decision to move (Jamieson, 2000; Garasky, 2002; Jentsch and Shucksmith, 2004).

Agriculture has always represented an important source of jobs in Russian rural areas. The agricultural reforms of the early 1990s were intended to change the Soviet agricultural system, which was characterized by the provision of surplus capital for industrialized processes and the ruthless exploitation of rural populations (Davydova and Franks, 2006). A principal objective of the agricultural reforms was to support the private ownership of land and family-based private farms (Serova, 1998; Spoor and Visser, 2001). The reform was expected to provide new jobs and entrepreneurial opportunities in agriculture and to promote rural development. However, the reform failed to meet those expectations (Davydova and Franks, 2006), and only 15% of the population that remains in Russian villages works in agriculture (Shibaeva, 2012). On the one hand, young people with agricultural educations face high unemployment in Russian rural agricultural areas after graduating from university, which forces their migration to cities (Kareva, 2003). On the other hand, farms in peripheral areas suffer greatly from the lack of agricultural specialists (Chekavinskiy, 2012).

### 2.3. Quality of life

The importance of non-economic factors has also been recognized (Rudzitis, 1991). Thus, greater attention must be paid to quality of life factors that influence migration decisions (Findlay and Rogerson, 1993). Quality of life is one of the factors that motivates the migration process and is considered a key factor in the choice of a destination (Findlay and Rogerson, 1993; Findlay et al., 2000; Stockdale, 2006). The quality of life concept is specific to individual cultures and is influenced "... by the conditions prevailing in different societies in specific, geographically and historically constrained contexts" (Findlay and Rogerson, 1993, p. 41). Quality of life is greatly affected by the socio-economic characteristics of a community. For example, rural inhabitants often lack access to adequate employment, education and health opportunities and suffer from insufficient social and technical amenities. The migration of rural people to cities is a common response to the disparities between cities and rural communities in terms of quality of life (Hemmasi and Prorok, 2002). Recent Russian sociological studies suggest that the major motivation for migration to cities is a desire to improve one's quality of life (Krikunov, 2012; Sanzhiev, 2009; Kareva, 2003). Shibaeva (2012) maintains that the critical socio-economic situation in Russia, which was caused primarily by unemployment, inadequate working conditions and poor access to

medical care, negatively affects quality of life in rural areas and thus intensifies out-migration tendencies among young people.

#### 2.4. Personal background

##### 2.4.1. Gender

Gender differences have been shown to affect migration in various regions. Women are more likely than men are to migrate from rural communities to urban areas to escape the rural lifestyle. In addition, women usually have higher educational aspirations than men do. With higher levels of education, women have more opportunities to find jobs in the tertiary sector of cities (Fuguitt et al., 1989; Corbett, 2007; Thissen et al., 2010). Young women also face relatively more pressure to leave their parental villages because the main sources of well-paid local employment are not available to them (Corbett, 2005).

##### 2.4.2. Age

Mobility rates were found to be highest for people between the ages of 16 and 29 years (Stockdale, 2006; Cromartie, 2000). Within this age group, the likelihood of leaving home increases as age increases (Garasky, 2002). The principal driving forces for migration differ based on the life cycle stage of an individual (Stockdale, 2006). Rérat (2014) supports the importance of life cycle stage on migration behavior. For example, having children or having a partner from the parental municipality or region increases the likelihood of settling in that area.

##### 2.4.3. Education

People who obtain higher levels of education are more inclined to leave rural communities (Corbett, 2007; Kodrzycki, 2001). Rural young people want not only to fulfill their career, academic and personal development potential (Stockdale, 2006) but also to demonstrate their job skills and abilities (Gibbs and Cromartie, 1994). Thissen et al. (2010) note that the transition from secondary to higher education is increasingly responsible for the declining numbers of young people in rural areas. In their study, young people in peripheral rural regions in the Netherlands were more inclined to leave their regions if they were more highly educated. However, the authors could not confirm this relationship in peripheral rural regions in Belgium. Stockdale (2006) found that many graduates consider leaving the parental home to be a natural progression. To obtain higher education, young people in rural communities must move to the city. The migration process is facilitated by the fact that highly educated youth are more cosmopolitan than deeply connected with their communities (Corbett, 2005; Weenink, 2008; Thissen et al., 2010).

### 3. Study area – Altai Krai

#### 3.1. Socio-economic situation in Altai Krai

Altai Krai is a rural, agrarian region in Russia characterized by a heterogeneity of natural conditions and strong agricultural specialization of the regional economy. Altai Krai is located in the southeast portion of western Siberia (Fig. 1). It occupies an area of 168 ths. km<sup>2</sup> which represents 1% of the Russian territory. The number of inhabitants of Altai Krai reached 2.4 million in 2013. Approximately 29% of them live in the regional capital, Barnaul, which is located 3419 km from Moscow. The cross-border position of Altai Krai creates opportunities for its international cooperation with Asian countries but, at the same time, means that the area is remote from the western and eastern borders of Russia, which is reflected mainly in high transport costs (Eremin and Bykov, 2011). An important characteristic of Altai Krai is its high share of rural

population. Rural inhabitants represent 44.5% of the regional population, placing Altai Krai in 10th place for rural inhabitants within regions in Russia (26%) and in 2nd place within the regions of the Siberian Federal Administrative Territory (28%) (Rural Development of Altai Krai (2011)).

The socio-economic structure of Altai Krai has undergone significant changes in the past 25 years. The transition to a market economy in the 1990–2000 period was characterized by the development of the private ownership of land and the establishment of private companies, new forms of management and business activities. This led to a sharp increase in the number of business entities (from 6.87 ths. units in 1990 to 60.977 ths. units in 1995) (Akstat, 2014) as well as to a deep economic crisis in all sectors of the economy caused by rupture of existing economic relations, immature institutions of government support and regulation of the markets and imperfection in the existing market infrastructure. The crisis period of 1992–1998 in Altai Krai, and in Russia as a whole, is characterized by a long-term decline in production and investments, high inflation (135.4% in 1999), increasing unemployment and a decline of living standards (Mishenko, 2006).

Since 2000, a period of economic growth has begun in Russia in general and in the Altai region in particular. The main base for economic growth in the region has been the rapid development of the food processing industry. The impact of the global financial crisis of 2008–2009 interrupted the trend of economic growth in the region. The area least affected by the crisis was agricultural production, which showed a significant increase in the value of output in Altai Krai by 10.4% in 2009 compared to 2008 (an increase of 2.2% in Russia) (Akstat, 2014).

Generally, the economic performance of Altai Krai lags behind the national average. Its share of the Russian gross domestic product was 0.7% in 2012, and its regional gross domestic product per capita was 44% of the Russian gross domestic product per capita (RSY, 2014). The processing industry accounts for 80% of the region's industrial activity and comprises mainly food processing (33% of the processing industry), machinery and chemical companies (Eremin and Bykov, 2011).

Altai Krai is one of the largest agricultural regions of the Russian Federation and one of two agricultural regions in Siberia (the second region is the Republic of Altai, located nearby). Its total agricultural area accounts for 45.5% of the regional territory, 70% of which is arable land. Altai Krai has the largest area of acreage dedicated to cereals and pulses among all regions of Russia. Livestock production also represents an important part of the agricultural production from the perspective of both Altai Krai and the Russian Federation (Altai Krai in numbers, 2012). Due to the region's long agricultural tradition, the agro-industrial sector is one of the most developed areas of the regional economy. In 2011, the primary sector represented 16% of total gross regional product (Altai Krai in numbers, 2012).

Because a significant portion of jobs are concentrated in the cities, the most difficult situation in the labor market appears in rural areas, where more than 75% of registered unemployed people live and where there is a maximum of 25% of all registered vacancies (Aksp, 2015a). In the 2005–2012 period, the share of economically active people employed in the primary sector decreased from 20.7% to 19.5% (the national average in 2012 was 9.0%), the number in the manufacturing sector decreased from 16.0% to 13.0% (the national average was 15.0%), and the number in services increased from 47.7% to 51.6% (the national average was 56.0%). The share of employees in state and municipal institutions fell from 36% in 2005 to 30% in 2012, whereas in the private sector, it increased from 57% to 63%, respectively (Aksp, 2015b). Data about sectoral employment in rural and urban areas are not available, but the industrial capital of Altai Krai Barnaul offers a variety of



Fig. 1. Position of Altai Krai within the Russian territory.

government, educational, business and service job opportunities. Agricultural enterprises are one of the most important suppliers – sometimes the only supplier – of employment opportunities in rural areas.

Since 1991, the share of employees working in agriculture has decreased by 5.6%–19.2% in 2014 (Krai, 2014). This is not a dramatic decrease. However, the structure of workforce has changed significantly. Many specialized local workers have been replaced by unskilled or semi-skilled migrants from the countries of the former Soviet republics. Statistics on agriculture in Altai Krai show that on average, 15% of people working in specialized positions such as veterinarians, livestock specialists or engineers have no relevant education (Aksp, 2015b).

The economy of rural areas can be characterized by a low degree of entrepreneurial activity. The development of individual and small enterprises in the rural areas of Altai Krai lags behind the urban areas. Individual enterprises in rural areas represent only 39%, and small enterprises represent only 15% of all enterprises in the Krai. Additionally, rural areas usually do not provide new job opportunities in industry and services because most of them are located in urban areas. Wages in rural areas of Altai Krai are approximately 50% lower than wages in urban areas (Rural development of Altai Krai (2011)).

Rural areas in Altai Krai face many problems that are typical of rural areas in Russia, including insufficient technical infrastructure, a lack of social amenities such as medical treatment, schools, services and leisure time activities, a lack of jobs, an aging population, and out-migration. Only 54% of families have access to the water supply, 39% of families have sewerage, and only 7% of rural families have hot water (Rural development of Altai Krai (2011)). Furthermore, 24% of the villages in Altai Krai are not accessible by paved

roads (Altai Krai in numbers, 2012). During the Soviet era, large-scale agricultural enterprises were irreplaceable providers of social services, rural infrastructure and jobs for village communities. Although these large-scale enterprises continue to exist, they are threatened by local budgets and market-oriented agricultural reforms and are no longer able to support local communities (Davydova and Franks, 2006). These insufficient living conditions particularly discourage young people from living in or returning to rural villages.

### 3.2. Migration in Altai Krai

Social, economic and political reforms after the end of the Soviet Union led to changes in migration. One of the main transformations in Altai Krai was the change of its geopolitical status from an inner region to a frontier region. Since 1989, the positive migration caused by the massive influx of people from Middle Asia, particularly from Kazakhstan (45 ths. Russians from Kazakhstan between the years of 1992 and 2004 because the living conditions for Russian people became worse in Kazakhstan after the collapse of the Soviet Union), together with natural population growth caused by the high birth rate in the 1960s, led to the increased population in the region (Cvetkov, 2009).

The reduction of the total population began in 1995 when the migration growth could not fully compensate for the natural decline of the population. The massive migration from rural areas was evoked by several factors: the decline of agricultural production in terms of the overall Russian economic crisis, increasing differences in wages in agriculture and industry in favor of the latter, the chronic delay in the payment of wages in all sectors of the economy (particularly manifested in agriculture), and the scale of

unemployment in rural areas, which exceeded the natural rate (Cvetkov, 2009). Furthermore, thousands of people of German origin emigrated to Germany, especially in the 1990s (Rogga, 2011).

Since the beginning of the 21st century, the rural areas of Altai Krai have been significantly affected by the declining population (Eremin and Bykov, 2011). The dynamics of rural migration are clearly correlated with the reduction in peripheral agricultural settlements caused by the polarization of rural populations. On the one hand, the number of regionally important cities increased; on the other hand, many villages remained without settlements. Two-thirds of rural inhabitants live in villages with less than 1000 inhabitants (Eremin and Bykov, 2011). During the 2000–2012 period, the population of Altai Krai decreased by 9.3%, and its rural population decreased by 15.6% (Akstat, 2014).

Fig. 2 shows the demographic changes in the 1995–2014 period in Altai Krai described above. The figure does not show the situation before 1995 because the significant statistical decrease of the urban population and simultaneous increase of the rural population at the beginning of the 1990s was caused by administrative and territorial changes in Altai Krai. These changes do not indicate the real trend in migration.

The number of migrants with higher education, both in inter- and intra-regional migration, has increased in Altai Krai. The most numerous group in terms of migration is migrants with university and secondary vocational education. The region loses an annual average of 2.3 ths. educated people due to inter-regional migration (Aksp, 2015b). The largest group of people who leave rural villages comprises young people who move to cities in Altai Krai. They seek better-paying jobs, more sufficient living conditions and higher education than their parental rural communities can offer. For many rural youth, the only barrier to leaving the rural municipality is the lack of financial resources to cover transport costs (Sergienko et al., 2013).

### 3.3. Main political documents supporting rural development in Russia and Altai Krai

Agricultural development got higher priority at the beginning of the 21st century. The national program Social Development of Rural Villages to 2013 was introduced in 2003. Most measures of this program were focused on improving social infrastructure in villages

and involved the support of local agriculture, the development of technical infrastructure and efforts to attract young specialists to rural villages. This program was followed by a new national program, Sustainable Development of Rural Areas for the period 2014–2017 and for the period through 2020 (National Program), introduced in 2013 with a budget of 4.3 billion EUR.

To address regional conditions, the Strategy of Social and Economic Development of Altai Krai until 2025 (Strategy) has been drawn up and implemented. One of the top priorities of the Strategy is to ensure dynamic growth and to increase the level of competitiveness of the regional agribusiness. To implement the Strategy, the Ministry of Agriculture of Altai Krai approved the program Sustainable Development of Rural Areas in Altai Krai for the period 2014–2017 (Regional Program). This program corresponds with the National Program, is partially financed from the federal budget and develops individual measures that address regional conditions. The main priority of the Regional Program is to create decent working and living conditions in villages to attract qualified young people to live and work in those areas. Local authorities and businesses should be involved in providing jobs for these specialists. The new measures for rural development are closely linked with measures intended to support farmers.

The National Program allocated 2.03 billion EUR for these purposes. This budget should help to create 32 ths. working places and improve living conditions for 75.5 ths families (Rybakova, 2013). However, evidence of the impacts of this funding is not available. New National and Regional Programs include some rules with progressive directions. The direct co-financing of the Regional Program has been replaced by subsidizing measures of state support for the region. This means that regions themselves must ask for financial resources, which are provided through subsidies. Principals of project financing are widely used to format the chain of production and the processing and marketing of agricultural products. Comprehensive agricultural development will integrate the procurement and sales structure of all types of entities, including large agricultural holdings, small businesses and private households. The idea is that the development of intraregional relations can make the rural population more active and mobile and can prevent the rural inhabitants from having to leave their homes in search of a better life (Krai, 2014).

Krikunov (2012) conducted a study of the effectiveness of the

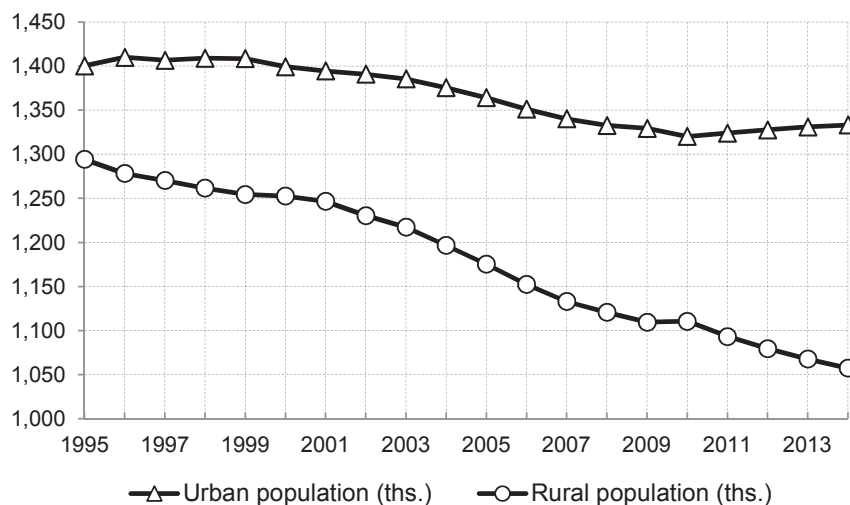


Fig. 2. Demographic changes in Altai Krai, 1990–2014.  
Source: Akstat (2014).

previous program, Social Development of Rural Villages to 2013, and noted that there was a direct relationship between the implementation of the program and the suspension of out-migration in Altai Krai. Several factors had a negative impact on the effectiveness of this social program: low awareness by young people about support programs, lack of professional staff working with young people in Altai Krai, insufficient proactive work of the committee for economics and municipal property on the investment literacy of young entrepreneurs, and the absence of an integrated program for the revitalization of villages in Altai Krai. These drawbacks should be taken into account when developing a new policy agenda and implementing new rural development measures.

#### 4. Sample selection and research methodology

Barnaul is an important regional center of scientific development where 8 state and 4 private universities are located. The number of all students in this area exceeds 80 ths. We defined the target population for our research as students of the Altai State Agrarian University in Barnaul whose parental communities are rural municipalities in Altai Krai. Altai State Agrarian University is a federal state budgetary educational institution established in 1943. The number of full-time students was 3.6 ths. in 2014. The respondents were full-time students in their fourth and fifth years at the university. As a rule, students at this point have lived in the city and have an idea of their specialization and the opportunities and challenges of urban life, and most have formed an idea about their future employment and prospects in life. Data on migration motivations were collected by questionnaires. Three study groups of students were interviewed in year 4 and three groups in year 5 before the beginning of their lessons. The purpose of the survey and the rules for completing the questionnaire were explained to the students before they began completing the questionnaires. The average duration of the completion of a questionnaire was 15 min.

The final number of students who completed questionnaires was 500, and valid questionnaires were obtained from 474

students. To achieve the objective of our research, we excluded 26 respondents who were not residents of Altai Krai. The remaining 448 students originated from 178 municipalities in Altai Krai (see Fig. 3). These municipalities vary in size, and their populations range from 27 to 42 000. Because we were interested in the migration intentions of students from rural municipalities, we excluded respondents whose parental municipalities are classified by the Statistical Office of Altai Krai (Akstat, 2014) as cities or towns. This criterion led to the exclusion of respondents from Barnaul (107 respondents), Rubcovsk (19 respondents), Novoaltaisk (9 respondents), Biisk (2 respondents) and Zariinsk (1). Thus, the final number of respondents in the study was 310. Respondents were distributed across all departments of the university, as follows: agronomical (18.3%), bio-technological (17.7%), economical (22.2%), engineering (16.1%), veterinary (15.4%) and natural sciences (10.3%). The average age of students included in the study was 20.1 years.

Data collection commenced in May 2014, when 200 questionnaires were distributed and collected. An additional 300 questionnaires were distributed and collected in September and October 2014. Students completed the questionnaires during classes. The survey provides information about factors that motivate educated young people either to leave their parental homes in rural areas in Altai Krai or to return home. To ensure that students understood the questionnaire, we conducted a pre-test survey with a group of 15 students at the State Agricultural University in May 2014.

The study of this specific cohort cannot provide overall information about the migration motivation of young people. It contributes solely to understanding what motivates young, agriculturally educated people to leave their rural parental communities or to return home. Furthermore, our questionnaire does not include a question regarding the place of future work. Therefore, we do not know whether students who plan to work in agriculture prefer to stay in the city and work in positions related to agriculture, work in agricultural enterprises in a suburb of Barnaul

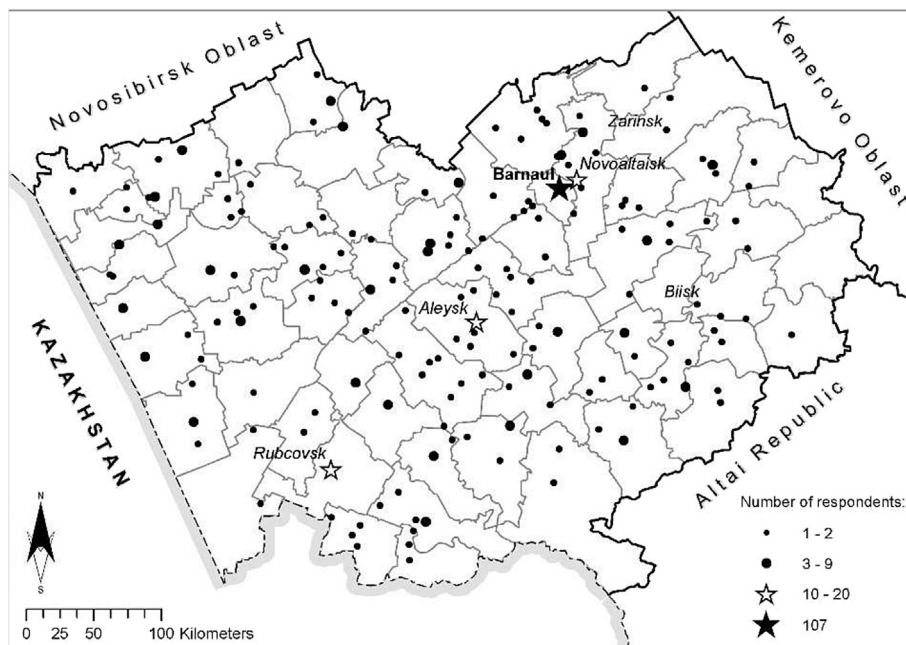


Fig. 3. Respondents' parental municipalities in Altai Krai (N = 448).

or work somewhere else.

The dependent variable of migration motivation was derived based on responses to a question regarding students' intentions to migrate out of their parental municipalities after completing university (Table A1). According to this definition, 83% of rural students expected to leave their parental municipalities and live elsewhere. In the analysis, we examined the factors (independent variables) that predicted such intentions. The factors were grouped into four thematic blocks: family background, employment expectations, quality of life and personal background. The variables included in the analysis are presented in Table A1.

Logit or probit regression is often applied in migration studies in which respondents decide whether to migrate or to stay at home (Bjarnason and Thorlindsson, 2006; Thissen et al., 2010; Garasky, 2002; Rérat, 2014). We used a logit regression model to estimate the influence of the following variables on migration intentions: the importance of education in respondents' families (parental encouragement to study agriculture); family background (ownership of land); employment expectations (future sector of employment or business and difficulty of establishing one's own business); quality of life (life satisfaction); and personal background (gender). The dependent variable "intention to migrate" is a binary variable; 0 means "yes" and 1 means "no".

The variable describing whether respondents had children was excluded from the model because of the small number of positive responses (only 12 respondents reported having children). We created dummy variables from the categorical variables, such as parental employment status, parental educational levels and sector of work. We used the statistical software package STATA to perform the statistical analysis. The regression model was tested for multicollinearity using a variance inflation factor (VIF). The results showed that the mean VIF was 1.24 and thus was below the threshold of 10 suggested by Chatterjee and Hadi (2006) and O'Brien (2007). Therefore, we concluded that no serious multicollinearity problem existed between the explanatory variables used in the model.

## 5. Results and discussion

We tested four groups of variables that affected the migration motivations of students at an agricultural university: family background, employment expectations, quality of life and personal background. Table 1 summarizes the results of the logit model addressing migration decisions.

The roles of several family background factors are ambiguous. For example, our results show no significant effect of parental education on migration motivation. In addition, family income does not explain migration intention in our model. We found that having siblings who had already left the parental home did not significantly affect migration intentions. Our results also show that parents' employment status did not influence migration decisions. Even the fact that 24% of respondents stated that their parents worked in agriculture did not influence migration decisions in our sample. However, respondents whose families are rooted in agriculture tend to return home after finishing university. These young people are expected to continue in the family agricultural tradition. In contrast, young people seeking non-agricultural employment or employment in services related to agriculture, such as Ministry of Agriculture, or Statistical Office, often must leave the region to find suitable jobs. In this context, it is not surprising that general family background factors do not significantly affect migration decisions.

Two variables were tested to determine the effect of parental support for education. The first variable, parental encouragement to attain the highest level of education, had no significant effect on decisions to migrate. However, parental encouragement to study agriculture was a very significant factor. Specifically, respondents who reported parental encouragement to study agriculture were more likely to return to their parental communities than other respondents. Almost all respondents whose parents supported the study of agriculture and who intended to return to their parental municipalities indicated that their future employment would be in agriculture. Furthermore, 41% of mothers and 30% of fathers who supported their child had achieved a university degree. Many of

**Table 1**  
Results of logit regression analysis of migration motivations of agricultural students in Barnaul (N = 310).

Variable	Odds ratio	Dummy variables
<b>Family background</b>		
1. Parents support education	1.352	
2. Parents encouraged agricultural study (dummy variable)	2.482**	
3. Number of siblings	1.309	
4. Siblings out of Altai Krai	0.893	0 – none 1 – one or more
5. Education of mother	0.775	0 – secondary technical education and university 1 – secondary
6. Education of father	0.803	0 – secondary technical education and university 1 – secondary
7. Employment status of father_self-employed	1.075	0 – business employee, civil servant and unemployed 1 – self employed
8. Employment status of mother_self-employed (dummy)	2.420	
9. Employment status of father_unemployed	1.666	0 – self-employed, business employee and civil servant 1 – unemployed
10. Employment status of mother_unemployed (dummy)	1.191	
11. Family income	0.799	0 – ≤ 20,000 rubles 1 – ≥ 20,001 rubles
12. Family owns land (dummy variable)	2.833**	
<b>Employment expectations</b>		
13. Employee or own business (dummy variable)	0.595	
14. Difficult to establish business	1.929**	
15. Future sector of employment or business	3.508***	0 – manufacturing, wholesale & retail trade, services and others 1 – agriculture
<b>Quality of life</b>		
16. Attracted to rural life	1.233	
17. Life satisfaction	0.821*	
<b>Personal background</b>		
18. Gender (dummy variable)	0.361***	

Pseudo R<sup>2</sup> = 0.176, Probability > chi<sup>2</sup> = 0.001.

\* p-value < 0.1; \*\*p-value < 0.05; \*\*\*p-value < 0.01.

these parents were farmers, and it can be assumed that they encouraged their child to be their successor.

Family ownership of land is another significant factor, increasing the likelihood of returning to the parental village. Based on the questionnaire, parents of 13% of the respondents owned land. The size of the land owned differed significantly among these families. Most of the families owned 2 ha on average, but one family owned 900 ha, and one owned 2000 ha. Parental ownership of agricultural land influences employment expectations. All males who wanted to return to their parental municipalities after finishing university and whose families own land reported that they would like to work in agriculture. Based on these factors, it is likely that these respondents will maintain their family properties. The importance of the agricultural roots of the family is evident. Agriculture is often the only employment possibility in the parental village, and the existence of family property can facilitate students' return home. The difference between genders is obvious in this context: female respondents whose parents owned land were unwilling to work in agriculture.

The results regarding employment expectations show that respondents who indicated a desire to work in agriculture were more likely to return to their parental municipalities than those who planned to work in manufacturing, wholesale and retail trade, services or other sectors. All respondents were students at an agricultural university; thus, one might expect that their future jobs would be in agriculture or in related fields. However, the reality is different. A prevailing unwillingness to work in agriculture was detected among agricultural students from rural areas of Altai Krai. Overall, 21.2% of all respondents planned to work in agriculture after finishing university, and only 7.4% of all respondents wanted to work in agriculture in their parental municipality. A more detailed survey is needed to detect the location of future jobs if graduates do not plan to return home.

A significant relation between the sector of desired employment and migration intention was found in our model. Specifically, respondents who wanted to work in agriculture were more likely to return home after finishing university. This is positive news, especially for agricultural enterprises, because many of these enterprises (particularly those in peripheral rural areas) are experiencing a shortage of specialists, including animal production managers and veterinarians. In this context, Kareva (2003) describes a labor market failure in Russian rural areas. Agriculture once represented the main source of job opportunities and income in rural areas, and strong relationships existed between agricultural vocational schools and agricultural enterprises. These relationships were virtually nonexistent by the end of 1993. As a result, more than 50% of the graduates of agricultural vocational schools each year encounter serious problems with employment, and agricultural enterprises fail in their efforts to recruit highly educated specialists. The latter can be explained by the fact that agricultural wages in Altai Krai are the lowest among all other sectors (Ivanova, 2011), and the social infrastructure in rural areas is insufficient for living. Difficulties in finding jobs for graduates of agricultural vocational schools might be partly due to the in-migration of cheap working forces from Kazakhstan or other areas. Most employers prefer to employ unqualified cheaper workers to save money on salaries at the expense of work quality.

Respondents who did not consider the establishment of their own business in the parental municipality to be difficult had an increased propensity to return home. Corbett (2005) found that the children of self-employed parents perceive the entrepreneurial path as more familiar and that these children can benefit from their parents' knowledge and support. Our research confirms that respondents whose parents have their own businesses are more

willing to establish businesses of their own. These results have important implications because our research also shows a significant relation between the perceived difficulties of establishing one's own business and the propensity to leave the parental community. Respondents who consider the establishment of their own business to be difficult are more likely to migrate, whereas the ability of children with self-employed parents to learn from their parents' business experience can mitigate the perceived difficulties and thus diminish migration intentions.

Two variables related to quality of life were included in the model. The attractiveness of the rural lifestyle had no effect on respondents' migration intentions. Most respondents (64%) indicated they were attracted by the rural way of life. This finding shows the willingness of respondents to live in rural areas. However, the current socio-economic situation in rural municipalities may discourage them from returning. The respondents in our survey evaluated employment, educational and health-related indicators (such as employment opportunities, wage level, career opportunities, health care and educational provision) as the most important factors for life satisfaction. Respondents put less emphasis on shopping, leisure and sports facilities, the quality of roads, the unemployment rate, travel time to work and the presence of friends and relatives. The majority of the important indicators of life satisfaction are not sufficiently provided in rural municipalities. This situation forces young people from rural areas to find better living conditions in cities.

Respondents who reported the greatest levels of satisfaction with their current lives were more likely to intend to migrate than those who reported the lowest levels of life satisfaction. Thus, increased life satisfaction decreased the probability of returning. We found that the probability of migration from parental villages increases as respondents' life satisfaction increases. This relation may be because the respondents studied at a university in Barnaul, and those who were more content with city life were less likely to return home than those who were not satisfied with city life. Overall, the majority of the respondents were satisfied with their lives.

Finally, our results are consistent with those of Russian studies (e.g., Kareva, 2003; Krikunov, 2012) that show that rural women are more likely than rural men to anticipate leaving their parental municipalities. As Kareva (2003) found, the main reason for female out-migration from rural areas in Russia is the disproportionate share of rural occupations that favor men. The lack of traditional female occupations in agriculture and increasing unemployment rates in parental villages discourage females from returning home. The aversion of women to agricultural work and their efforts to find jobs in cities were confirmed by Krikunov (2012). In Altai Krai, 37% of rural women live in municipalities with up to 1000 inhabitants. Industry and government and social and other services are usually not located in such small villages. Statistics indicate (Aksp, 2015a) that 75% of all registered unemployed people live in rural areas in Altai Krai. Anecdotal evidence suggests that the number of unemployed people in small villages is much higher and that most of them are men. Sergienko et al. (2013) explain that women often replace men and support the family because men are unemployed, have low-paying jobs or are paid in-kind. Additionally, there is a higher proportion of widows among rural women compared to urban women due to the high rate of early death among men in the villages (Kozhina and Shabunova, 2012). This situation increases the economic activity of women and motivates them to achieve higher education. The results of our statistical analysis show that 36.7% of the respondents' mothers completed university in comparison to 25.6% of the respondents' fathers.

In addition, several non-economic factors have been identified



as possible reasons for the greater out-migration of women from rural areas. [Kozhina and Shabunova \(2012\)](#) identified the most important non-economic problems of rural women, including the remoteness of rural villages from cities; insufficient social infrastructure, particularly medical care and educational institutions; and low self-confidence and lack of confidence in a better future. Despite their completion of higher education, women in particular work in lower-paying assistant and technical positions. Rural communities are also characterized by a substantial portion of unpaid work expected from women. Many rural families practice subsistence farming for their own consumption, which is usually managed by women. These factors may explain the greater migration propensity among educated women, independently of occupational and educational opportunities.

In line with these considerations, our results show that 13% of female respondents wanted to work in agriculture after completing their university studies, but few of them planned to work in agriculture in the parental municipality. Overall, 7% of female respondents wanted to return home after finishing their university studies. Despite their agricultural education, most of these women planned to find administrative jobs in local industry. The preference for work in industry can be explained by the missing tertiary sector in the parental community. An intuitive conclusion from these results is that the new generation of educated women refuses to continue in the traditional social role of rural women, and their willingness to work in agriculture is diminishing.

## 6. Conclusion

Youth out-migration represents a significant loss of human capital from the donor communities ([Stockdale, 2006](#)). This paper on the migration of agriculturally educated youth focuses on the factors that affect the decision of whether to leave or to remain in the parental community after finishing university. Data from 310 questionnaires were analyzed using a logit model to test how selected factors affected migration motivation. The respondents originated from rural and agricultural areas, which typically are characterized by high unemployment rates, insufficient civil and technical amenities, and geographical remoteness from urban centers. The parental municipalities of nearly one-third of the respondents were located more than 300 km from the university. Our findings that only 17% of the respondents reported a desire to return home are consistent with the depopulation trend in rural areas of Russia, which has been shown in various Russian studies ([Kareva, 2003](#); [Motrich, 2006](#); [Krikunov, 2012](#); [Mkrtchyan, 2013](#); [Shibaeva, 2012](#)).

The fact that some of our respondents planned to return to the parental municipality indicate the existence of motivating factors, such as family background, when considering the migration of educated youth from rural areas. The same focus on parental occupation or entrepreneurship (such as agriculturally rooted families) and the focus on the university attended by children (such as agricultural universities) create an important background for young university graduates to return home and continue in the family tradition.

Some of the factors that affect migration behavior cannot be easily changed. Territorial isolation and financial difficulties limit rural women in almost all spheres of life. Lack of choices in employment and the long distance of many villages from cities or railways are such complicating factors that most educated women prefer to leave their parental municipality rather than to adapt. In addition, young educated rural women often reject the traditional social role of rural women and prioritize moving to a city.

The lack of a skilled and educated labor force in agriculture

threatens agricultural production, and heavy rural out-migration raises serious questions about who will work in specialized positions in agriculture in the future. On the one hand, the results of our study confirmed the overall trend of the out-migration of rural youth in Altai Krai. On the other hand, these results indicate several possibilities that can contribute to mitigating the out-migration of agriculturally educated young people. These outcomes may be used as a basis for the effective allocation of financial resources from national and regional funds, especially when the promotion of agriculture is the priority of socio-economic policy of Altai Krai due its key role in the development of rural areas.

Our results show that a strong relationship to agriculture decreases out-migration intentions among agricultural students. In particular, parental encouragement to achieve an agricultural education and to continue the family agricultural tradition motivates young people to return home. Policy support of the recovery or enhancement of relationships between agricultural schools and agricultural enterprises may help to develop contacts between young specialists and agricultural enterprises.

The willingness of young people to establish their own agribusiness in rural areas may be considered an important message for policy makers. However, the success of policy support depends on the better communication of information about policy measures to the target group of young agricultural specialists. Furthermore, the acquisition of agricultural land and agricultural land ownership relationships are very complicated in Russia. The simplification of the process of land acquisition together with the availability of and access to credit for business establishment and the purchase of agricultural land could increase the willingness of young people to stay in rural areas and to establish businesses in agriculture.

In Russia, the rural economy depends on farming. In the past, large-scale agricultural enterprises played the role of employers and providers of social services to the village community ([Davydova and Franks, 2006](#)). Currently, the role of large-scale agricultural enterprises has been partially replaced by both national and regional programs for rural development and small enterprises. Research in Russia shows evidence of new small enterprises that have succeeded to give work for family and other villagers ([Sätre, 2010, 2012](#)). In Altai Krai, a degree of entrepreneurial activity is low. To reduce the out-migration of youth, especially women, from rural area, national and regional authorities should consider the effective implementation of political measures promoting the improvement of living conditions in rural municipalities. An increase of support for small enterprises to provide jobs and social services might help to achieve this aim.

We explored the factors that affect the probability of out-migration among young agriculturally educated people from their parental rural municipalities. In connection with the lack of skilled labor in agricultural enterprises in Russian rural areas, a more in-depth study to determine the factors that affect students' willingness to work in agriculture could provide new and interesting insights. Understanding the barriers that may influence young rural people's decisions of whether to work in agriculture might help to stem the out-migration of young people from rural areas.

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## Appendix

Table A.1

Descriptive statistics of dependent and independent variables used for logistic regression analysis of the migration intentions of 310 students at the Agricultural University in Barnaul, 2014.

Question code	Question type <sup>a</sup>	Question text	List of answers	% of respondents
<b>Dependent variable: Intention to migrate</b>				
<b>Family background</b>				
1. Parents support education	MCo	Do you want to migrate out of your parental municipality after completing university?	0 – yes 1 – no	83.0 17.0
2. Parents encouraged agricultural study (dummy variable)	MCo	My parents always encouraged me to reach the highest level of education.	0 – strongly agree 1 – agree 2 – disagree 3 – strongly disagree	72.3 26.0 1.0 0.6
3. Siblings	OP	My parents encouraged me to study agriculture.	0 – yes 1 – no	68.2 31.8
4. Siblings out of Altai	OP	How many siblings do you have?	0 – none 1 – 1 2 – 2 3 – 3 4 – more than 3	20.6 59.2 12.2 5.5 2.6
5. Education of mother	MCo	How many siblings live outside the parental household?	0 – none 1 – 1 2 – 2 3 – 3 4 – more than 3	59.8 30.5 6.1 2.9 0.6
6. Education of father	MCo	What is the highest educational level completed by your mother?	0 – secondary education 1 – secondary technical education 2 – university	18.0 45.3 36.7
7. Employment status of mother	MCo	What is the highest educational level completed by your father?	0 – secondary education 1 – secondary technical education 2 – university	20.7 52.8 26.5
8. Employment status of father	MCo	What is the employment status of your mother?	0 – self-employed 1 – business employee 2 – civil servant 3 – unemployed	8.4 23.2 48.9 19.6
9. Family income	MCo	What is the employment status of your father?	0 – self-employed 1 – business employee 2 – civil servant 3 – unemployed	15.9 38.6 31.2 14.3
10. Family owns land (dummy variable)	MCo	What is the average income of your family per month?	≤20,000 rubles 20,001–60,000 rubles ≥60 001 rubles	57.3 40.1 2.6
<b>Employment expectations</b>				
11. Employee or own business (dummy variable)	MCo	My family owns land.	0 – yes 1 – no	87.1 12.9
12. Difficulty of establishing business	MCo	Do you plan to be an employee or to establish your own business?	1 – employee 2 – own business	64.6 35.4
13. Future sector of employment or business	OP	Do you consider the establishment of one's own business in your parental municipality to be difficult?	0 – yes, it is very difficult 1 – yes, it is difficult 2 – no, it is not difficult	33.8 57.2 9.0
14. Attracted to rural life	MCo	In which sector do you want to work or run a business after completing university?	1 – Agriculture 2 – Manufacturing 3 – Wholesale & retail 4 – Services 5 – Others	22.9 21.9 9.4 16.8 29.0
<b>Quality of life</b>				
15. Life satisfaction	MCo	Are you attracted to the rural lifestyle?	0 – yes 1 – yes, if economic and social conditions are satisfactory 2 – no	14.2 64.2 21.6
<b>Personal background</b>				
16. Gender (dummy variable)	MCo	All things considered, how satisfied are you currently with your life?	0 – not at all satisfied to 10 – extremely satisfied	
			0 – male 1 – female	40.5 59.5

<sup>a</sup> MCo: multiple choice, one answer; OP: open question.

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## Erklärung über selbständige Verfassung der Habilitationsschrift

Hiermit bestätige ich	Miroslava Bavorová
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dass ich die Habilitationsschrift mit dem Titel „Innovations and Food Chain Actors‘ Behavior“ selbständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe.

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