Routledge
Taylor & Francis Group

Journal of Environmental Planning and Management

ISSN: 0964-0568 (Print) 1360-0559 (Online) Journal homepage: http://www.tandfonline.com/loi/cjep20

Determinants of the perceived administrative transaction costs caused by the uptake of an agri-environmental program

Gabriele Mack, Andreas Kohler, Katja Heitkämper & Nadja El-Benni

To cite this article: Gabriele Mack, Andreas Kohler, Katja Heitkämper & Nadja El-Benni (2019): Determinants of the perceived administrative transaction costs caused by the uptake of an agri-environmental program, Journal of Environmental Planning and Management, DOI: 10.1080/09640568.2018.1515311

To link to this article: https://doi.org/10.1080/09640568.2018.1515311

Published online: 15 Jan 2019.

Journal of Environmental Planning and Management, 2019
https://doi.org/10.1080/09640568.2018.1515311

Routledge
Taylor & Francis Group

Determinants of the perceived administrative transaction costs caused by the uptake of an agri-environmental program

Gabriele Mack*, Andreas Kohler, Katja Heitkämper and Nadja El-Benni

Federal Department of Economic Affairs, Education and Research (EAER), Agroscope, Ettenhausen, Switzerland

(*Received 26 February 2018; final version received 10 August 2018*)

Farmers' subjectively perceived that administrative transaction costs are of high importance for the uptake of agri-environmental programs with direct effects on the effectiveness and efficiency of these programs and the well-being of farmers. This paper empirically estimates private administrative transaction costs resulting from an uptake of the newly introduced grassland-based milk and meat program in Switzerland, based on farmers' perceived administrative workload. Using ordered logit models, we analyze how the administrative tasks and farm and farmer characteristics influence the perceived administrative workload. We find that the time spent on monitoring or inspection tasks has no effect. In contrast, an outsourcing of program-related administrative tasks significantly reduces the perceived administrative workload. We also find that a better understanding of agricultural policy regulations significantly reduces the farmers' perceived administrative workload. We recommend that public administration improve the communication of agricultural policy regulations, rather than investing in the simplification of administrative forms.

Keywords: Transaction costs; workload; agri-environmental program; administrative work

1. Introduction

It is well known that the shift from price support to direct payments has increased the transaction costs of agricultural policies (Vernimmen, Verbeke, and Van Huylenbroeck 2000; Rørstad, Vatn, and Kvakkestad 2007). These transaction costs include those arising at government level, such as enforcing compliance with the program requirements (Weber 2014), and those arising at farm level, such as providing the environmental services required by the program.

Transaction costs concern both the setting up of the system and the running of the system (Vatn 2010), and whether the former or latter costs are more relevant depends on the system (e.g. Wunder, Engel, and Pagiola 2008; Wunder and Albán 2008). While flat-rate payments based on easily observable resources, such as areas of farmland, generate rather low transaction costs. Transaction costs increase with more targeted and tailored programs, such as specific agri-environmental measures or

*Corresponding author. E-mail: gabriele.mack@agroscope.admin.ch

animal-friendly production systems (Vatn 2010). This is because the costs of administering these often highly specific payment schemes are increasing (Falconer and Saunders, 2002; Vatn 2002; Rørstad, Vatn, and Kvakkestad 2007).

For instance, Rørstad, Vatn, and Kvakkestad (2007) found the transaction costs of flat-rate acreage and livestock payments with simplified control to be about 1–2% of the amount provided through these payments, while this increased to about 70% for more specific amenities with substantial control. Based on Riordan and Williamson (1985), Rørstad, Vatn, and Kvakkestad (2007) found that transaction costs (a) are very low if payments are attached to already existing commodities; (b) decrease per unit costs, *ceteris paribus*, if frequency of use increases, (c) are higher, the higher asset specificity becomes. In addition, learning and experience in running the system can be expected to reduce transaction costs over time (Vatn 2010; Nilsson 2009).

Farmers' private transaction costs resulting from an uptake of agri-environmental schemes can be manifold, including forgone income (Uthes *et al.* 2010; Mettepenningen, Verspecht, and Van Huylenbroeck 2009) and more working time or physical workload needed due to changes in farm management processes (Beckmann, 1996) or due to an increase in administrative work (Vernimmen, Verbeke, and Van Huylenbroeck 2000; Moriz 2007; Moriz and Schick 2007; Mettepenningen, Verspecht, and Van Huylenbroeck 2009). This additional administrative burden is the result of the increasing number of regulations intended to reduce the negative environmental impacts of agricultural production, which makes agricultural policy more and more complex for farmers (Vernimmen, Verbeke, and Van Huylenbroeck 2000).

While some of these costs can be relatively easily quantified, and thus measured, other costs are subjective, difficult to measure, and highly dependent on farms' and farmers' specific characteristics. However, these subjectively perceived transaction costs are of high importance for the uptake of different direct payment schemes with direct effects on the effectiveness and efficiency of these programs and the well-being of farmers. For instance, a number of recent studies have shown that administrative work is often experienced as a stressor for farmers: for example, the mounting paperwork demand, workload intensification, and changes in agricultural regulation have increased the stress levels of farmers in England and Wales in measurable ways (Parry, Lindsey, and Taylor 2005). Kallioniemi *et al.* (2016) revealed that administrative work is one of the greatest stressors for Finnish farmers. For Switzerland, Reissig (2017) found that administrative work significantly increases the burn-out risk in Swiss farming families. Both the Swiss farmers' increasing transaction costs due to administrative work and the negative consequences for their well-being led the Swiss administration to set up a project on the simplification of farmers' administrative tasks in 2016 (Hasler and Werder 2016).

Studies on the reduction of perceived administrative transaction costs of farmers are so far very limited and focus mainly on the simplification of administrative processes (Armsworth *et al.* 2012; Cordova-Novion and Jacobs 2004; Heitkämper, Umstätter, and Schick 2016). Other studies are primarily concerned with the determinants of the uptake of agri-environmental programs taking into account administrative work specifically (e.g. Coggan *et al.* 2015; Dupraz *et al.* 2002; Falconer 2000; McCann and Claassen 2016; Mettepenningen, Verspecht, and Van Huylenbroeck 2009). While studies discussing the determinants of farmers' administrative transaction costs from a theoretical point of view have been available (Shahab, Clinch, and O'Neill 2018), empirical studies are still rare. To close part of this research gap, the goal of this study is to gain better insight into the determinants of the perceived

administrative transaction costs caused by an uptake of agri-environmental programs. We empirically estimate the perceived administrative transaction costs based on the farmers' rated administrative workload. In our study we consider workload determinants described by Cain (2007), such as the number of administrative tasks, their time requirements, and their complexity as well as farm and farmers' characteristics which influence the handling of administrative tasks (Coggan *et al.* 2015).

More specifically, we focus on the determinants of the perceived administrative workload resulting from an uptake of the voluntary grassland-based meat and milk (GMF) program. This agri-environmental program was introduced in Switzerland in 2014. It aims to support the locally adapted, efficient use of meadow forage and pasture for dairy and meat production and restrict the concentrate feed supplementation of ruminants to an upper limit of 10% (Mack and Huber 2017). While some of the private and public transaction costs can be expected to be low, in that payments are area-based and inspections are integrated into overall cross-compliance inspections, farmers are required to fulfill a range of administrative tasks to be eligible for these payments.

This study is based on a written survey of 2,000 Swiss farmers conducted in 2016. Participants were asked to rate not only their perceived administrative workload for participating in the GMF program but also their time resources spent on completing the administrative tasks of the GMF program and the cross-compliance obligations. For analyzing the determinants of the administrative workload, ordered regression analysis was used. To our knowledge, there are, so far, no empirical studies available that investigate the impact of administrative tasks and time resources on the perceived administrative workload of farmers. Based on the results, we derive recommendations for the public administration of how the perceived administrative workload of farmers could be reduced in order to increase the mental well-being of farmers and reduce their transaction costs.

The second section describes the database, our hypotheses and their theoretical and empirical foundations, and the regression models with the underlying variables. The third section presents the results of the survey and the ordered regression model, and the fourth section draws conclusions as to how the perceived administrative workload of farmers can be reduced.

2. Methodological approach

2.1. Farm survey

A written survey among 2,000 randomly selected farmers was conducted during months 3–5 2016, all over Switzerland. Farmers' contact information was provided by the Swiss Federal Office for Agriculture, which maintains a database of all farm households that receive direct payments, comprising about 98% of all Swiss farms. To boost the response rate, we first invited all farmers to participate in an online survey. Those who did not participate in the online survey within two weeks received the questionnaire via mail. This procedure led to a high response rate of approximately 50%, although some participants did not answer all of the questions. The relevant questions for this study were on farm and farmer characteristics, time requirements, and the perceived administrative workload. All farmers were asked whether they adopted the grassland-based milk and meat program.

2.2. Perceived administrative workload (dependent variable)

The choice of the dependent and independent variables used in this study are broadly based on the concept of the term 'workload' representing a proxy for perceived administrative transaction costs. This is because farmers often argue against the uptake of additional voluntary agri-environmental schemes because of the expected additional 'workload' caused by administrative work (Falconer 2000; Falconer and Saunders 2002; Heitkämper, Umstätter, and Schick 2016; McCann and Claassen 2016).

However, few formal definitions of workload have been established in the literature (e.g. Eggemeier and Wilson 1991; Gopher and Donchin 1986; Kramer, Sirevaag, and Braune 1987; Lysaght *et al.* 1989), and a clearly defined, universally accepted definition of the term is missing (Cain 2007; Johannsen 1979). For instance, Macdonald (2003, 102) defines "workload as a hypothetical construct … which reflects the perceived margin between task demands and an individual's motivated coping capacity." In a literature review on the concept of *mental* workload, Cain (2007, 1) distinguishes three broad categories: "the amount of work and number of things to do; time and the particular aspect of time one is concerned with; and, the subjective psychological experiences of the human operator." As workload is very broad, and can be influenced by numerous factors, it is impossible to directly observe the workload imposed on a person (Casali and Wierwille 1984). Subjective ratings for workload represent a very frequently used method to assess perceived workload (Hill *et al.* 1992; Johannsen 1979; Rubio *et al.* 2004).

In our study, we use farmers' self-assessments to collect information on their perceived administrative workload related to the GMF program. Therefore, we asked farmers, on a three-point Likert scale, for their assessment of the statement "The administrative workload for adopting the GMF program is too high." Based on the concept of workload, we define the determinants of the independent variables, which are described below.

2.3. Program complexity affecting perceived administrative workload for the GMF program (independent variables)

Existing research shows that the uptake of agri-environmental programs causes the highest administrative work for farmers among all agricultural policy measures (Rørstad, Vatn, and Kvakkestad 2007). This is because these programs require the completion of a number of complex administrative tasks (Coggan, Whitten, and Bennett 2010), such as (a) information gathering prior to implementation; (b) completing monitoring tasks, which require time and resources to present monitoring data and comply with the monitoring process; and (c) completing enforcement tasks, also requiring time and resources, in the case that a lack of compliance is found. There also exists a great variety of approaches to handling the administrative tasks by the farmers, which in turn influences the time resources used: for example, the workload could be further reduced by outsourcing administrative work to third parties (Vernimmen, Verbeke, and Van Huylenbroeck 2000) or by using software tools to prepare the monitoring data. However, the specific design of the agri-environmental programs is crucial for the perceived workload, that is, the administrative transaction costs.

The Swiss grassland-based milk and meat (GMF) program restricts the feeding regime in ruminant production[1] and requires annual monitoring of the farmers' roughage and concentrate use. Participants are obliged to monitor the roughage and concentrate intake based on a feeding balance (so-called Feed-Balance; Agridea 2015a). In addition, they need to fulfill the monitoring obligations for cross-compliance. Therefore, they have to annually record their nitrogen and phosphorus inputs, as well as the outputs based on a nutrient balance (so-called SUISSE-Balance; Agridea 2015b). The majority

of Swiss farmers outsource the preparation of the monitoring forms for SUISSE-Balance to agricultural extension organizations or to feedstuff suppliers, who offer this service without charging (Heitkämper, Umstätter, and Schick 2016; Mack *et al.* 2017). In this case, farmers have to provide them with data on animal and crop production as well as feedstuff and fertilizer purchase. For the preparation of the Feed-Balance, almost the same database is used as for the preparation of the SUISSE–Balance. Moreover, the same institutions (agricultural extension organizations and feedstuff suppliers) offer the service of preparing the monitoring forms for the GMF program.

Inspections of the GMF program are integrated in a system where a random selection of 25% of Swiss farms that receive direct payments from the Swiss government are controlled per year. Before inspections are announced, farmers have to provide all the required documents and present them during inspections.

In this study, we group the administrative tasks concerned with monitoring into three categories. Moreover, we consider two variables describing inspections and one enforcement variable:

- Monitoring I is described as "time spent on making data available for cross-compliance and GMF requirements."
- Monitoring II refers to "outsourcing the preparation of monitoring forms for cross-compliance requirements."
- Monitoring III refers to "outsourcing the preparation of monitoring forms for the GMF-program."
- Inspection I is described as "time spent on providing data for cross-compliance and GMF inspections."
- Inspection II is described as "time spent on attending cross-compliance and GMF inspections."
- Enforcement describes whether "enforcement measures had to be completed in the past."

To collect data on the above-mentioned, program-specific administrative tasks we asked the survey participants to estimate, on a time scale, the time spent on each administrative task necessary to comply with the rules of the GMF program. We used time scales (e.g., 0–2 hours, 2–4 hours, and so on) that cover the variance measured by Moriz (2007) for similar administrative tasks.

We defined three hypotheses as to how the design of the GMF program and its administrative tasks might influence the perceived administrative workload:

Monitoring I and Inspection I/II tasks [Monitoring I; Inspection I; Inspection II] – We hypothesize that the greater the time spent on making available documents for both monitoring and inspection issues, the higher the rated administrative workload.

Monitoring II/III [Monitoring II; Monitoring III] – The outsourcing of administrative tasks is practiced because of the high complexity of the legislation, which represents a major problem for farmers, and in order to reduce the responsibility and risk associated with possible mistakes (Vernimmen, Verbeke, and Van Huylenbroeck 2000). Saving time is also a major reason for the outsourcing of administrative tasks (Vernimmen, Verbeke, and Van Huylenbroeck 2000). Thus, we hypothesize that outsourcing simplifies farmers' administrative work, reduces their time requirements, and therefore reduces the rating of the workload.

Enforcement tasks [Enforcement] – Completing enforcement tasks in the case that a lack of compliance is found not only requires time and resources, it is often combined with fines, which increases the negative attitude toward the government. Thus, we hypothesize that enforcement activities increase the ratings for administrative workload.

2.4. Farm and farmer characteristics affecting perceived administrative workload for the GMF program (independent variables)

Based on the literature on how transactor characteristics impact the transaction costs of agri-environmental programs (Coggan *et al.* 2015; Ducos, Dupraz, and Bonnieux 2009; Shahab, Clinch, and O'Neill 2018) and the workload concept of Cain (2007), we derive hypotheses as to how farm and farmer characteristics affect the perceived administrative transaction costs (dependent variable) that are empirically tested in this study.

- Age [Age] – Environmental regulations and the associated administrative tasks are important matters in the vocational education of young farmers. Thus, we expect that young farmers will rate the workload lower than their older peers. In the survey, farmers were asked for their age.
- Knowledge of policy regulations [Policy information] – We expect that a better knowledge and understanding of agricultural regulations reduces the ratings for workload. To measure farmers' level of information about agricultural policy in Switzerland, we asked the participants of the survey to evaluate the statement "Agricultural policy changes caused by the reform period 2014–2017 are difficult to understand" on a three-point Likert scale.
- Environmental attitudes [Environment] – We hypothesize that the more positive the attitude toward the environment and conservation, the lower the rating for administrative workload. To measure farmers' attitudes toward the environment and conservation practices, we asked survey participants to evaluate on a three-point Likert scale the statement "Protection of the environment is an important task of farmers."
- Experience with other programs [Other programs] – We expect that the more frequently farmers adopt environmental programs, the lower their rating for administrative workload [H7]. In the survey, farmers were asked to mark on a list those agri-environmental programs in which they participate.
- Participation in the GMF program [GMF] – We expect that farmers who adopted the GMF program perceive the workload to be lower than do their non-participating peers [H8]. However, self-selection into the program might be due to different reasons, which we control for by adding this variable into the model.
- Type of production system [Organic] – Because organic farms fulfill the GMF program obligations without any feeding changes, we expect such farmers to rate the workload lower than their non-organic peers [H9]. Participants in the survey were asked if they produce organically (yes/no).
- Farm type [Predominantly suckler cows, Predominantly other cattle, Predominantly horses/sheep/goats, Predominantly fattening beef, Combined dairy and arable production, Combined suckler and dairy cows, Combined other production] – Some farm types, such as predominantly suckler-cow farms, require much less data to

fulfill the monitoring obligations than combined farms, and will therefore rate the workload lower than do their peers with mixed farms [H10]. Farmers participating in the survey were asked for their predominant farm type (dairy, suckler cows, other cattle, horses/sheep/goats, fattening beef, combined dairy and arable production, combined suckler and dairy cows, combined other production).

2.5. Regression models

Since the dependent variable (rated workload) is measured on an ordinal scale, multinomial models are inefficient because they ignore the ordering information. The linear regression model is inappropriate, because it implicitly assumes an interval scale (Winkelmann and Boes 2009). Furthermore, the ordered responses from 1 to 3 on the Likert scale are mutually exclusive, but can be ranked from low to high. However, the values assigned to the particular outcomes (i.e. disagree, indifferent, agree) are arbitrary, and thus expectations (as modeled in linear regression models) have no meaning.

To take the inherent ordering of our dependent variable into account, we estimate ordered response models. The following description of ordered response models closely follows Winkelmann and Boes (2009) and Wooldridge (2009). The ordered response model for the dependent variable y, conditional on independent variables x, can be derived from a latent variable model. The latent variable can be thought of as the propensity to agree with the statement that the administrative workload for adoption of GMF is too high. Suppose that a latent variable $y^\star$ is determined by

$$y_i^\star = x_i'\beta + u_i,$$

where u_i is an iid error term with distribution function (cdf)s $F(u)$. The vector x contains all independent variables but no constant. In particular, we include independent variables associated with administrative tasks, farm and farmer characteristics and farmer attributes. Our observed dependent variable y_i relates to the latent variable $y^\star$ through the following threshold mechanism:

$$y_i = j \text{ if } \alpha_{j-1} < y_i^\star \leq \alpha_j \; j = 1, 2, \; 3,$$

where $\alpha_1, \alpha_2, \alpha_3$ are three unknown threshold parameters to be estimated, since we normalize $\alpha_0 = -\infty$ and $\alpha_3 = \infty$ as is standard in the literature. Given our distributional assumption about the error term, each response probability can be computed as

$$P(y_i = j|x_i) = P\left(\alpha_j < y_i^\star \leq \alpha_{j-1}\right) = F\left(\alpha_j - x_i'\beta\right) - F\left(\alpha_{j-1} - x_i'\beta\right) \; j = 1, \; 2, \; 3.$$

The parameters (α's and β's) of the model can be estimated by maximum likelihood. We estimate linear, logit and ordered logit models to test the robustness of the results. Ordered logit assumes that the error term follows a logistic distribution $\Lambda(u)$, that is $F(u) = \Lambda(u)$.

It is important to note that parameters β are of limited interest, since they refer to the expectation of the latent dependent variable $y^\star$. We are interested in the response probabilities $P(y_i = j|x_i)$. The marginal effect of independent variable x_k on probability $P(y_i = j|x_i)$ is given by

$$\frac{\partial P(y_i = j|x_i)}{\partial x_k} = \beta_k \left[f\left(\alpha_{j-1} - x_i'\beta\right) - f\left(\alpha_i - x_i'\beta\right) \right] \; j = 1, \; 2, \; 3,$$

and depends on threshold parameters α and the values of all other independent variables x. From above, it is clear that the sign of marginal probability $\partial P(\cdot)/\partial x_k$ depends

on the sign of β_k, and on the sign of the term in square brackets, except for $P(y_i = 1|x_i)$ and $P(y_i = 1|x_i)$, where the sign is unambiguously determined by β_k.

Note that in comparing results from different models, estimated parameters β are not directly comparable. We must compare estimated response probabilities at various values of x; for example, the median.

3. Results

3.1. Descriptive sample results

Table 1 shows frequencies and summary statistics for the dependent (workload) and independent variables. Of the respondents, 40% disagree with the statement that the "administrative workload for adopting the GMF program is too high." More than a quarter neither agree nor disagree with this statement, while 34% agree.

Respondents spend, on average, 42 minutes on making available all the documents necessary for cross-compliance and GMF monitoring [variable Monitoring I]. A minority of the respondents (8%) noted that they spend less than 15 minutes on the provision of documents and a quarter stated that they require between 15 and 30 minutes. Forty-five percent of the respondents stated that they need more than 45 minutes to provide these data.

More than three quarters of the respondents (77%) noted that they outsource the preparation of monitoring forms for cross-compliance obligations [variable Monitoring II]. Furthermore, a majority of the respondents (82%) outsource the preparation of monitoring forms for the GMF program [variable Monitoring III]. The minority who complete the monitoring forms by themselves need, on average, 30–60 minutes. Only 5% of the respondents noted that they require more than one hour to complete the monitoring forms for the grassland-based milk and meat program.

Making all the documents available for inspection requires, on average, 186 minutes [variable Inspection I]. Of the respondents, 36% answered that they need less than two hours, while about one-third (29%) require more than four hours. Attending cross-compliance and GMF inspections takes, on average, 86 minutes. Only a quarter of the respondents answered that inspections take less than one hour [variable Inspection II]. Of the respondents, 80% stated that enforcement activities did not take place in the past [variable Enforcements].

On average, the respondents adopt three other agri-environmental programs besides the GMF program. About 27% of the respondents participate in more than five programs. Of the respondents, 22% were below 40 years old, while the majority were between 40 and 60 years old. Organic farming was practiced by 10% of the respondents. Predominantly dairy production was the most frequent farm type (37%), followed by combined dairy and arable production (24%). Predominantly suckler cow and predominantly other cattle were the production types of 15% of respondents, or approximately 7% each.

Table 1 shows the means of the total Swiss farm population for all variables available in the sectoral statistics. Our sample is quite representative in terms of age, GMF participation, organic farming, and the production portfolio of farms.

3.2. Results of the regression analysis

The results of the ordered logit model are depicted in Table 2. As the interpretation of the coefficients of an ordered logit model is not straightforward, we explain the influence of the (statistically significant) independent variables on the rated workload based on the predicted probabilities ($y^\star$) displayed in Figure 1. Table A1 in the Appendix shows the

Table 1. Frequencies and summary statistics of the dependent and independent variables.

Variable name	Description	Coding	Frequency [%]	Mean	Median	SD	Min	Max	No. of statements	Population[a] mean
		Dependent variable								
Workload	Attitude towards statement "The administrative workload for adopting the GMF program is too high"	1 = disagree 2 = indifferent 3 = agree	40 26 34	1.94		0.86	1	3	797	
		Independent variables: administrative tasks								
Monitoring I	Time spend for making data available for cross-compliance and GMF monitoring	in minutes		42.10	37.5	19.67	7.50	67.50	797	
Monitoring II	Outsourcing the preparation of monitoring forms for cross-compliance	0 = no outsourcing 1= outsourcing	23 77	0.77	1	0.42	0	1	852	
Monitoring III	Outsourcing the preparation of monitoring forms for the GMF program	0 = no outsourcing 1= outsourcing	18 82	0.82	1	0.38	0	1	840	
Inspection I	Time spent on making available data for cross-compliance and GMF inspections	in minutes		186.21	180	124.22	60	420	766	
Inspection II	Time spent on attending cross-compliance and GMF inspections	in minutes		86.53	75	33.53	15	135	758	
Enforcement	Enforcement measures had to be completed in the past	0 = no 1 = yes	78 22	0.22	0	0.41	0	1	859	
		Independent variables: farm and farmer characteristics								
Age	Age of farmer	in years		48.50	49	9.48	22	67	776	50.4
Policy information	Attitude towards statement "Agricultural policy changes caused by the reform period 2014–2017 are difficult to understand"	0 = indifferent/disagree[b] 1 = agree	27 73	0.73	1	0.45	0	1	859	
Environment	Attitude towards statement "Protecting the environment is an important task for farmers"	0 = indifferent/disagree[c] 1 = agree	39 61	0.61	1	0.49	0	1	859	

(*Continued*)

Variable name	Description	Coding	Frequency [%]	Mean	Median	SD	Min	Max	No. of statements	Population[a] mean
Other programs	Adoption of other agri-environmental programs	0 = no	5	0.95	1	0.23	0	1	859	
		1 = yes	95							
GMF	Participation in GMF program	0 = no	35	0.65	1	0.48	0	1	859	0.67
		1 = yes	65							
Organic	Organic farming	0 = no	90	0.10	0	0.30	0	1	854	0.12
		1 = yes	10							
Farm type	Production portfolio of farm	1 = predominantly dairy production (Reference)	36	3.25		2.22	0	1	753	36
		2 = predominantly suckler cows	16							11
		3 = predominantly other cattle	6							14
		4 = predominantly horses/sheep/goats	6							
		5 = predominantly fattening beef	7							10
		6 = combined dairy and arable production	26							25
		7 = combined suckler and dairy cows	1							4
		8 = combined other production	2							

[a]Sources: Bundesamt für Landwirtschaft (2016) and Bundesamt für Statistik (2016).
[b]We assume that both indifferent and disagreeing respondents do not have difficulties in understanding policy changes.
[c]We assume that for both, indifferent and disagreeing respondents protecting the environment is an unimportant task for farmers.

change in the predicted probabilities for all statistically significant variables. Table 2 further illustrates that the results of the ordered logit model are robust to model specifications, as the linear model and the logit model show very similar results.

The results of the ordered logit model in Table 2 show that the time spent on providing all the monitoring documents [variable Monitoring I] has hardly any influence (or a weak significance level) on the rated workload. Similarly, the time spent on attending inspections [variable Inspection I] has no impact on the rated workload. In contrast, outsourcing the preparation of monitoring forms for cross-compliance obligations [variable Monitoring I] and for the GMF program [variable Monitoring II] has a significant and strong positive and negative effect, respectively. Moreover, the experience of enforcement measures in the past [variable Enforcement] shows a significant influence on the perceived administrative workload. With regard to the farm and farmer characteristics, farmer age [variable Age] has hardly any effect on the perceived administrative workload. Furthermore, neither environmental attitudes [variable Environment] nor experience with other agri-environmental programs [variable Other programs] are relevant to perceived administrative workload. In contrast, knowledge of policy regulations [variable Policy information], adoption of the GMF program [variable GMF], and organic farming [variable Organic] significantly influence the perceived administrative workload. Furthermore,

Table 2. Results of the logit and ordered logit analysis.

	Linear	Logit (marginal effects at median)	Ordered Logit (unstandardized coefficients)
Administrative tasks			
Monitoring I	0.004* (0.002)	0.008 (0.005)	0.010* (0.005)
Monitoring II	0.365** (0.145)	0.886** (0.444)	0.944** (0.366)
Monitoring III	–0.364** (0.167)	–1.083** (0.494)	–1.000** (0.410)
Inspection I	0.000 (0.000)	0.001 (0.000)	0.001 (0.001)
Inspection II	–0.000 (0.001)	–0.000 (0.001)	0.000 (0.003)
Enforcement	0.173** (0.081)	0.509** (0.227)	0.461** (0.208)
Farmer and Farm characteristics			
Age	0.006 (0.004)	0.011 (0.003)	0.015* (0.009)
Policy information	0.264*** (0.073)	0.947*** (0.049)	0.692*** (0.222)
Environment	–0.012 (0.088)	0.116 (0.218)	–0.285 (0.187)
Other programs	0.089 (0.152)	–0.033 (0.424)	0.245 (0.395)
GMF	–0.370*** (0.088)	–0.763*** (0.24)	–0.918*** (0.395)
Organic	–0.383*** (0.103)	–0.784** (0.376)	–0.986*** (0.311)
Farm type			
Predominantly suckler cows	–0.216** (0.102)	–0.652** (0.312)	–0.530** (0.256)
Predominantly other cattle	–0.413*** (0.131)	–1.555*** (0.608)	–1.082*** (0.367)
Predominantly horses/sheep/goats	0.132 (0.158)	0.211 (0.440)	0.349 (0.367)
Predominantly fattening beef	–0.086 (0.131)	–0.237 (0.355)	–0.234 (0.340)
Combined dairy and arable production	–0.034 (0.090)	–0.131 (0.246)	–0.090 (0.217)
Combined suckler and dairy cows	–0.427 (0.427)	–0.114 (1.42)	–1.056 (0.975)
Combined other production	–0.456* (0.237)	–0.911 (0.731)	–1.198* (0.605)
Observations	580	580	580

Notes: Robust standard errors in parentheses. Dependent variable in the logit model is constructed as a dummy variable equal to 1, indicating agreement with the statement, or equal to 0, indicating disagreement or indifference (the results are very similar with 1 indicating agreement or indifference and 0 indicating disagreement).

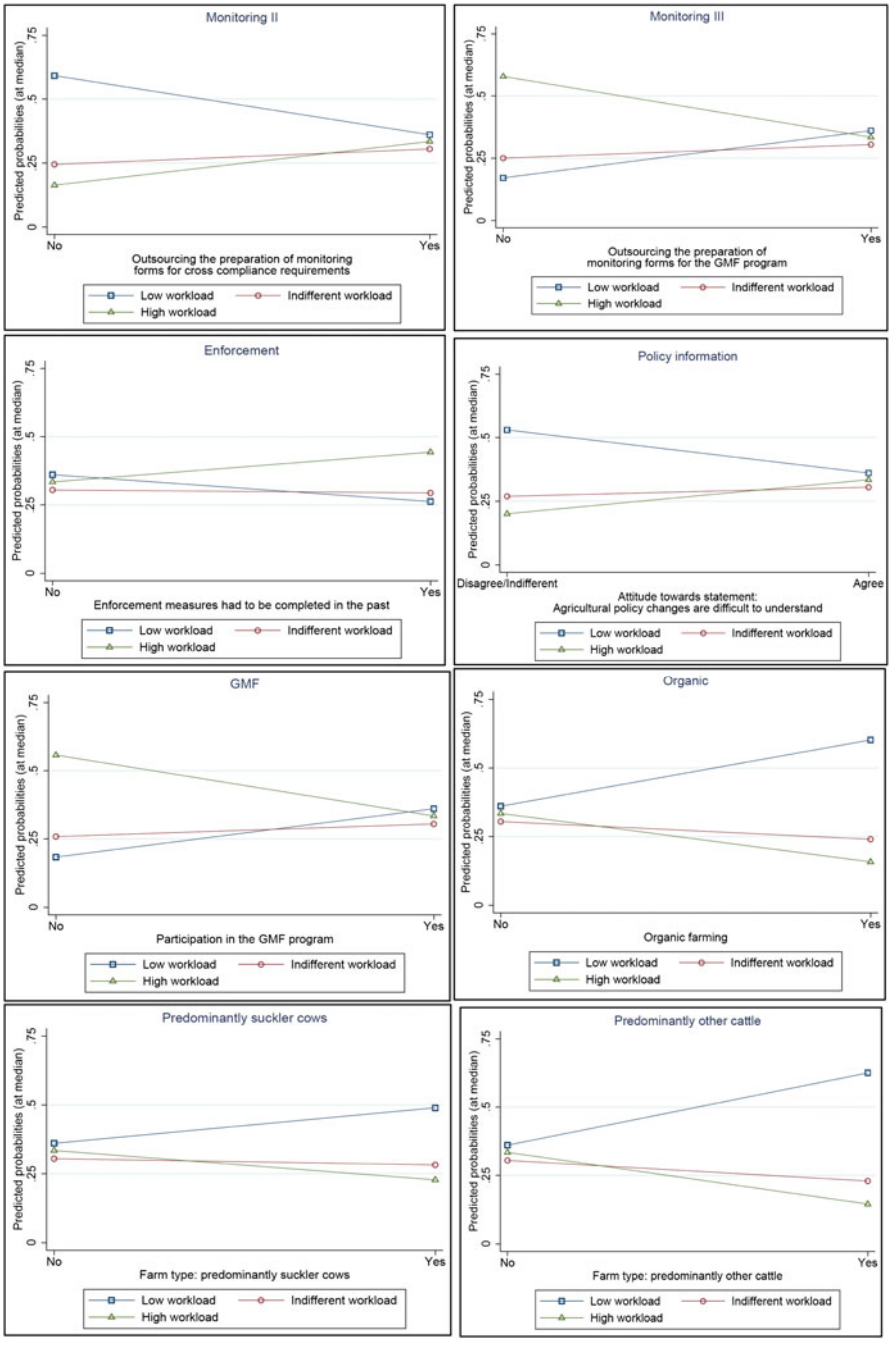

Figure 1. Effects of the statistically significant independent variables on the predicted response probabilities of the rated workload.

some farm types, such as predominantly suckler-cow farms or predominantly other-cattle farms, show a significant effect on the rated workload.

Figure 1 depicts the predicted probabilities for a low, indifferent, or high rating of the workload (y-axis) against two different states of a (statistically significant)

independent variable (*x*-axis). Figure 1, Monitoring II (Outsourcing the preparation of monitoring forms for cross-compliance requirements), shows that non-outsourcing and outsourcing farms rate the administrative workload differently: Half of the non-outsourcing respondents assess their administrative workload to be low and approximately 20% of them rate it as being high. In contrast, in the group of outsourcing farms, fewer respondents (than the non-outsourcing; ∼30%) rate their workload to be low and more respondents (than the non-outsourcing; ∼30%) rate the workload to be high. Thus, outsourcing respondents assess the administrative workload of the GMF program to be significantly higher than do non-outsourcing respondents [variable Monitoring II]. In contrast, outsourcing the preparation of the monitoring forms for the GMF program [variable Monitoring III] reduces the administrative workload significantly. Figure 1, Monitoring III, shows that the respondents who do not outsource the monitoring forms of the GMF program rate the workload higher than do their peers who outsource this administrative task.

Figure 1, Enforcements, indicates that enforcement activities in the past increase the ratings for the workload significantly: The three workload rating classes are almost equally distributed in the respondent group without enforcement activities. In contrast, the majority of the respondents in the group with enforcement activities rates the workload to be high. The results in Figure 1, Policy information, further show that respondents rate the administrative workload significantly lower when they have no difficulties in understanding agricultural policy regulations compared to those who do have difficulties. GMF participation (Figure 1, GMF) also influences the ratings for the workload: Respondents who participate in the GMF program rate the administrative workload significantly lower than do their non-participating peers. Furthermore, organic farms (Figure 1, Organic) rate the administrative workload of the GMF program significantly lower than do non-organic farms. Moreover, predominantly other-cattle farms and suckler-cow farms rate the workload significantly lower than do their peers.

4. Discussion

The results of the study indicate that the design and complexity of the agri-environmental program influences the perceived administrative workload. We reject hypothesis H1, testing if the time spent for administrative tasks related to cross-compliance and GMF requirements [variables Monitoring I; Inspection I; Inspection II] influences the perceived administrative workload for the GMF program. In contrast, we find that outsourcing of the GMF monitoring forms [variable Monitoring III] reduces the perceived administrative workload for the GMF program. Thus, we confirm hypothesis H2 with regard to GMF monitoring forms. However, we must reject H2 considering the outsourcing of cross-compliance requirements [Monitoring II]. We find that farmers who outsource their cross-compliance obligations rate the administrative workload for the GMF program significantly higher than their peers. These results might be caused by the fact that outsourcing is often practiced by farmers who do not like administrative work or feel overstretched (Vernimmen, Verbeke, and Van Huylenbroeck 2000). In addition, farmers might be less experienced with administrative tasks when they outsource them, and thus might rate the workload of new agri-environmental programs higher than do their more experienced peers.

We confirm hypothesis H3, testing whether enforcement activities in the past increase the perceived administrative workload of new agri-environmental programs

[variable Enforcement]. These results are in line with the literature on opportunistic behaviors and their impacts on private transaction costs (Shahab, Clinch, and O'Neill 2018). Opportunistic behaviors occur when an individual finds contract compliance costly and thus is unwilling to verify compliance with certainty (Ferraro 2008). Shahab, Clinch, and O'Neill (2018) stated that opportunistic behaviors of transactors, such as providing false, misleading or incomplete information, increase private transaction costs. In the case that opportunistic behaviors lead to enforcements, they further increase not only public but also private transaction costs.

Moreover, we find no evidence that younger farmers perceive the administrative workload to be lower than do their older peers [variable Age]. Thus, we reject hypothesis H4 that the young farmers' vocational education and training in the handling of administrative work reduces the perceived workload. We verified that knowledge of policy regulations significantly reduces the perceived administrative workload [variable Policy information]. These results confirm hypotheses H5 and are in line with the literature on the effects of experience, learning by doing, and a common ideology on transaction costs. Through a learning-by-doing effect, an individuals' past experiences can improve their ability in decision-making and reduce transaction costs (Shahab, Clinch, and O'Neill 2018). Furthermore, social connectedness and a common ideology imply a good understanding between different parties regarding the objectives and approaches of a policy. Both factors contribute to reduced transaction costs by increasing awareness, promoting connections, and building trust (Mettepenningen, Verspecht, and Van Huylenbroeck 2009). The literature on private transaction costs considers trust to be the opposite of opportunism (Shahab, Clinch, and O'Neill 2018). Through limiting opportunism, trust can reduce transaction costs (Ducos, Dupraz, and Bonnieux 2009; Mettepenningen, Verspecht, and Van Huylenbroeck 2009).

We reject hypothesis H6, testing the influence of environmental attitudes [variable Environment]. Our study shows that a common ideology in terms of environmental attitudes has no influence on the perceived administrative workload. We further reject hypothesis H7, verifying whether experience with other agri-environmental programs influences the perceived workload of the GMF program [variable Other programs]. We confirm hypothesis H8, testing whether farms adopting the GMF program perceive the workload to be lower than do their nonparticipating peers [variable GMF]. Moreover, we also accept hypothesis H9, testing if organic farmers perceive the workload associated with the uptake of the GMF program to be significantly lower than do their peers [variable Organic]. We suggest that these farms are aware of the fact that the administrative workload for the GMF program is almost covered by organic production requirements. Finally, we also confirm hypothesis H10 for predominantly suckler-cow farms and other-cattle farms [variables Predominantly suckler cows and Predominantly other cattle]. As for suckler-cow and other-cattle farms the additional time requirement for fulfilling GMF monitoring obligations is very limited, these farmers rate the workload lower than their peers.

5. Conclusions

As the provision of documents and data for monitoring or inspection obligations not only influences farmers' perceived administrative workload, we recommend that the public administration not focus on the simplification of monitoring forms or inspection requirements. We recommend instead that the public administration should focus on

improving their information policy in terms of agricultural regulations. As 73% of the farmers stated that "Agricultural policy changes caused by the reform period 2014–2017 are difficult to understand," we recommend the intensification of communication between public administration and farmers. We are convinced that policy information is a precondition to establishing a common understanding and a common ideology, and thus to reducing the perceived workload of farmers. As we find that outsourcing the preparation of the monitoring forms for the GMF program reduces the administrative workload of farmers significantly, agricultural policy should foster the outsourcing of the program-specific monitoring forms. Furthermore, we recommend that agricultural extension services should focus on mixed farm types in order to reduce their administrative workload.

Disclosure statement

No potential conflict of interest was reported by the authors.

Note

1. Ruminant farmers who adopt the GMF program have to meet two feed restrictions. First, the proportion of concentrates they use in the total feed for all ruminants must be lower than 10 percent throughout the year. Second, the proportion of grass in the total roughage feed for all ruminants must be higher than 75% for farms located in the lowlands and higher than 85% for farms located in the mountains. The GMF program guidelines define those feed components that count as roughage-based feedstuff (Der Schweizerische Bundesrat 2017, appendix 5, cypher 1): Permanent grassland/meadows and temporary leys/pastures (fresh/ensiled/dried), whole-plant maize (fresh/ensiled/dried), mixture of rachis and corn-cob kernels, coarse corn-cob meal and corn-cob silage without husks (CornCobMix [CCM] for cattle fattening only; in all other cases classed as concentrate), cereal-whole plant silage, fodder beet, sugar beet, sugar-beet pulp (fresh/ensiled/dried), beet leaves, chicory roots, potatoes, waste from fruit and vegetable processing, draff, straw for feeding. Thus, other animal feedstuffs not included in this list of roughage-based feedstuff count as concentrates.

References

Agridea. 2015a. "Agridea Futterbilanz (Excel) Version 1.3." Website. Accessed 20 January 2018. http://www.focusappa.ch/de-de/tools.aspx

Agridea. 2015b. "Agridea Nährstoffbilanz (Excel)." Website. Accessed 20 January 2018. http://https://www.agridea.ch/de/software/software/

Armsworth, P. R., S. Acs, M. Dallimer, K. J. Gaston, N. Hanley, and P. Wilson. 2012. "The Cost of Policy Simplification in Conservation Incentive Programs." *Ecology Letters* 15 (5): 406–414.

Beckmann, V. 1996. "Transaction Costs and Institutional Choice in Agriculture: The Example of Family vs. Hired Labour." Paper presented at the VIIIth EAAE Congress in Edinburgh, Scotland, September 3–7.

Bundesamt für Landwirtschaft. 2016. *Agrarbericht*. Bern, Switzerland: BBL. https://www.agrarbericht.ch/de.

Bundesamt für Statistik. 2016. *Landwirtschaftliche Betriebszählung, Zusatzerhebung 2013*.

Cain, B. 2007. *A Review of the Mental Workload Literature*. Toronto, ON: Defence Research and Development Canada.

Casali, J. G., and W. W. Wierwille. 1984. "On the Measurement of Pilot Perceptual Workload: A Comparison of Assessment Techniques Addressing Sensitivity and Intrusion Issues." *Ergonomics* 27 (10): 1033–1050.

Coggan, A., M. Grieken, A. Boullier, and X. Jardi. 2015. "Private Transaction Costs of Participation in Water Quality Improvement Programs for Australia's Great Barrier Reef: Extent, Causes and Policy Implications." *Australian Journal of Agricultural and Resource Economics* 59 (4): 499–517.

Coggan, A., S. M. Whitten, and J. Bennett. 2010. "Influences of Transaction Costs in Environmental Policy." *Ecological Economics* 69 (9): 1777–1784.

Cordova-Novion, C., and S. Jacobs. 2004. *Regulatory Management and Administrative Simplification in Belgium and Flanders*. Washington, DC: Jacobs and Associates; Brussels: Dienst Wetsmatiging.

Der Schweizerische Bundesrat. 2017. "Verordnung über die Direkzahlungen an die Landwirtschaft." Accessed 30 January 2018. https://www.admin.ch/opc/de/classified-compilation/20130216/index.html

Ducos, G., P. Dupraz, and F. Bonnieux. 2009. "Agri-Environment Contract Adoption under Fixed and Variable Compliance Costs." *Journal of Environmental Planning and Management* 52 (5): 669–687.

Dupraz, P., I. Vanslembrouck, F. Bonnieux, and G. Van Huylenbroeck. 2002. "Farmers' Participation in European Agri-Environmental Policies." Paper presented at the Xth EAAE Congress "Exploring Diversity in the European Agri-Food System", Zaragoza, Spain, August 28–31.

Eggemeier, F. T., and G. F. Wilson. 1991. "Performance-Based and Subjective Assessment of Workload in Multi-Task Environments." In *Multiple-Task Performance*, edited by D. L. Damos, 217–278. London: Taylor and Francis.

Falconer, K. 2000. "Farm-Level Constraints on Agri-Environmental Scheme Participation: A Transactional Perspective." *Journal of Rural Studies* 16 (3): 379–394.

Falconer, K., and C. Saunders. 2002. "Transaction Costs for SSSIs and Policy Design." *Land Use Policy* 19 (2): 157–166.

Ferraro, P. J. 2008. "Asymmetric Information and Contract Design for Payments for Environmental Services." *Ecological Economics* 65 (4): 810–821.

Gopher, D., and E. Donchin. 1986. "Workload: An Examination of the Concept. In *Handbook of Perception and Human Performance, Volume 2, Cognitive Processes and Performance*, edited by K. R. Boff, L. Kaufman, and J. P. Thomas, 41–49. New York: John Wiley.

Hasler, S., and D. Werder. 2016. Bericht zum Projekt "Administrative Vereinfachungen in der Landwirtschaft." Accessed 1 January 2018. https://www.blw.admin.ch/blw/de/home/politik/agrarpolitik/administrative-vereinfachung.html

Heitkämper, K., C. Umstätter, and M. Schick. 2016. "Administrative Vereinfachung in der Landwirtschaft." *Agrarforschung Schweiz* 7 (9): 390–395.

Hill, S. G., H. P. Iavecchia, J. C. Byers, A. C. Bittner, Jr, A. L. Zaklade, and R. E. Christ. 1992. "Comparison of Four Subjective Workload Rating Scales." *Human Factors* 34 (4): 429–439.

Johannsen, G. 1979. "Workload and Workload Measurement." In *Mental Workload: Its Theory and Measurement*, Vol. 8, edited by N. Moray, 3–11. New York: Springer Science and Business Media.

Kallioniemi, M. K., A. Simola, J. Kaseva, and H. R. Kymäläinen. 2016. "Stress and Burnout among Finnish Dairy Farmers." *Journal of Agromedicine* 21 (3): 259–268.

Kramer, A. F., E. J. Sirevaag, and R. Braune. 1987. "A Psychophysiological Assessment of Operator Workload During Simulated Flight Missions." *Human Factors* 29 (2): 145–160.

Lysaght, R. J., S. G. Hill, A. O. Dick, B. D. Plamondon, and P. M. Linton. 1989. *Operator Workload: Comprehensive Review and Evaluation of Operator Workload Methodologies (No. TR-2075-3)*. Willow Grove, PA: Analytics Inc.

MacDonald, W. 2003. "The Impact of Job Demands and Workload on Stress and Fatigue." *Australian Psychologist* 38 (2): 102–117.

Mack, G., K. Heitkämper, B. Käufeler, and S. Möbius. 2017. "Evaluation der Beiträge für Graslandbasierte Milch- und Fleischproduktion (GMF)." *Agroscope Science* 54: 1–99.

Mack, G., and R. Huber. 2017. "On-Farm Compliance Costs and N Surplus Reduction of Mixed Dairy Farms under Grassland-Based Feeding Systems." *Agricultural Systems* 154: 34–44.

McCann, L., and R. Claassen. 2016. "Farmer Transaction Costs of Participating in Federal Conservation Programs: Magnitudes and Determinants." *Land Economics* 92 (2): 256–272.

Mettepenningen, E., A. Verspecht, and G. Van Huylenbroeck. 2009. "Measuring Private Transaction Costs of European Agri-Environmental Schemes." *Journal of Environmental Planning and Management* 52 (5): 649–667.

Moriz, C. 2007. *Arbeitszeitbedarf für die Betriebsführung in der Landwirtschaft. Ein kausal-empirischer Ansatz für die Arbeitszeitermittlung in der Milchproduktion* (Dissertation Nr. 17 124). Zürich: ETH.

Moriz, C., and M. Schick. 2007. Betriebsführung und Arbeitsorganisation (ART-Bericht 673). Ettenhausen: Forschungsanstalt Agroscope Reckenholz-Tänikon ART.

Nilsson, F. O. L. 2009. "Transaction Costs and Agri-Environmental Policy Measures: Are Preferences Influencing Policy Implementation?" *Journal of Environmental Planning and Management* 52 (6): 757–775.

Parry, J., R. Lindsey, and R. Taylor. 2005. *Farmers, Farm Workers and Work-Related Stress (HSE Research Report 362)*. London: HSE.

Reissig, L. 2017. "Häufigkeiten von Burnouts in der Schweizer Landwirtschaft." *Agrarforschung* 8 (10): 402–409.

Riordan, M. H., and O. E. Williamson. 1985. "Asset Specificity and Economic Organization." *International Journal of Industrial Organization* 3 (4): 365–378.

Rørstad, P. K., A. Vatn, and V. Kvakkestad. 2007. "Why Do Transaction Costs of Agricultural Policies Vary?" *Agricultural Economics* 36 (1): 1–11.

Rubio, S., E. Díaz, J. Martín, and J. M. Puente. 2004. "Evaluation of Subjective Mental Workload: A Comparison of SWAT, NASA-TLX, and Workload Profile Methods." *Applied Psychology* 53 (1): 61–86.

Shahab, S., J. P. Clinch, and E. O'Neill. 2018. "Accounting for Transaction Costs in Planning Policy Evaluation." *Land Use Policy* 70: 263–272.

Uthes, S., C. Sattler, P. Zander, A. Piorr, B. Matzdorf, M. Damgaard, A. Sahrbacher, *et al.* 2010. "Modeling a Farm Population to Estimate On-Farm Compliance Costs and Environmental Effects of a Grassland Extensification Scheme at the Regional Scale." *Agricultural Systems* 103 (5): 282–293.

Vatn, A. 2002. "Multifunctional Agriculture: Some Consequences for International Trade Regimes." *European Review of Agriculture Economics* 29 (3): 309–327.

Vatn, A. 2010. "An Institutional Analysis of Payments for Environmental Services." *Ecological Economics* 69 (6): 1245–1252.

Vernimmen, T., W. Verbeke, and G. Van Huylenbroeck. 2000. "Transaction Cost Analysis of Outsourcing Farm Administration by Belgian Farmers." *European Review of Agriculture Economics* 27 (3): 325–345.

Weber, A. 2014. "How Are Public Transaction Costs in Regional Agri-Environmental Schemes Delivery Influenced by EU Regulations?" *Journal of Environmental Planning and Management* 57 (6): 937–959.

Winkelmann, R., and S. Boes. 2009. *Analysis of Microdata*. 2nd ed. Berlin, Heidelberg: Springer-Verlag.

Wooldridge, J. M. 2009. *Introductory Econometrics: A Modern Approach*. 4th ed. Stamford, CT: Cengage Learning.

Wunder, S., and M. Albán. 2008. "Decentralized Payments for Environmental Services: The Cases of Pimampiro and PROFAFOR in Ecuador." *Ecological Economics* 65 (4):685–698.

Wunder, S., S. Engel, and S. Pagiola. 2008. "Taking Stock: A Comparative Analysis of Payments for Environmental Services Programs in Developed and Developing Countries." *Ecological Economics* 65 (4): 834–852.

Appendix

Table A1. Probabilities of the significant variables in the ordered logit model.

Change Δ in probabilities	$\Delta Pr(y = D\|x)$	$\Delta Pr(y = I\|x)$	$\Delta Pr(y = A\|x)$
Monitoring I	–0.002**	0.000	0.002**
Monitoring II	–0.231***	0.060	0.171***
Monitoring III	0.189***	0.055	–0.244**
Enforcement	–0.098**	–0.011	0.109**
Policy information	–0.169***	0.036*	0.134***
GMF	0.177***	0.046*	–0.223***
Organic	0.241***	–0.065*	–0.177***
Farm type			
Predominantly suckler cows	0.129**	–0.022	–0.106**
Predominantly other cattle	0.264***	–0.075*	–0.189***
Combined other production	0.291*	–0.088	–0.203**

Notes: *$p < 0.01$; **$p < 0.05$; ***$p < 0.001$. Marginal effects computed at the median (except for farm type, computed at the mode).