The asset specificity issue in the private provision of environmental services: Evidence from agro-environmental contracts

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Abstract

Conservation practice adoption is classically explored through the technology lens. However, by introducing the trade-off between production cost savings and higher transaction costs, involved asset specificity level should be considered too. This paper addresses this issue in the case of agri-environmental contracts, in which subscribed agri-environmental practices are freely chosen by the farmer. Several studies have examined factors influencing farmers' adoption but none have distinguished practices from their associated asset specificity level and transaction costs. We fill this gap by assuming a utility maximizing farmer who compares contract payments with compliance costs. Transaction costs being endogenous and difficult to measure, we identify conditions in which these costs vary and derive testable propositions about these conditions' effect on the choice over asset specificity level. Estimations on a sample of 328 French farmers interviewed in 2005 confirm the existence of a transaction cost barrier in agro-environmental contract adoption. They also show factors such as distrust in the Government, uncertainty stemming from the opacity of public decisions and the non-similarity of transactions have a significant negative effect on the probability farmers choose more specific practices.

Key words: Agri-environmental contract, asset specificity, endogeneity, transaction costs

JEL classification : D23, Q12, Q28

La spécificité des investissements dans la fourniture privée de services environnementaux : évidences à partir des contrats agro-environnementaux

Résumé

Le contrat agro-environnemental est un instrument de politique publique largement utilisé en Europe dédié à la production de services environnementaux en milieu rural. C'est un contrat de 5 ans entre l'Etat et l'agriculteur où l'agriculteur s'engage à adopter des pratiques respectueuses de l'environnement qu'il est libre de choisir en échange d'une compensation financière. Sachant que la spécificité des investissements a un rôle majeur dans l'obtention de résultats environnementaux, il est important d'identifier les facteurs de comportement de l'agriculteur vis-à-vis des pratiques spécifiques. Bien que le comportement d'adoption soit largement traité dans la littérature empirique, le choix de la spécificité des actifs n'a pas encore été exploré. Cet article s'intéresse à cette question en supposant que l'agriculteur maximise son utilité et qu'il compare le paiement compensatoire de la pratique avec les coûts de conformité au cahier des charges. Les coûts de transaction n'ayant pas été pris en compte dans le calcul des paiements compensatoires, nous nous attendons à ce que le choix de l'agriculteur soit affecté par leur variabilité entre pratiques. Les conditions dans lesquelles ces coûts varient sont identifiées et nous dérivons des propositions sur l'effet de ces conditions sur le choix de spécificité des actifs. L'analyse empirique est basée sur un échantillon de 328 agriculteurs français interrogés en 2005. Les estimations supportent que le manque de confiance dans l'Etat, l'incertitude provenant de l'opacité des décisions publiques et la non-similarité des transactions ont un effet négatif significatif sur la probabilité que l'agriculteur choisisse des actifs spécifiques.

Mots-clés : contrat agri-environnemental, actif spécifique, endogénéité, coût de transaction

Classification JEL : D23, Q12, Q28

The asset specificity issue in the private provision of environmental services: Evidence from agro-environmental contracts

1. Introduction

Conservation practice adoption is classically explored through the technology lens (Dupraz et al., 2002; Soule et al., 2000; Traoré et al., 1998; Gould et al., 1989; Napier and Camboni, 1993) whereas involved asset specificity level gives rise to other important issues. This characteristic has a double implication. On the one hand, asset specificity permits cost savings to be realized, in that environmental outcomes highly depend on timing or localization aspects. On the other hand, these specificities require the production system to be entirely adapted and result in non negligible risky investments. Indeed, such investments are non redeployable without sacrifice of productive value if the contract should be interrupted or prematurely terminated. These elements constituting a hold up situation from which difficulties of writing contracts contingent on all important future events and the fact that these contracts can be renegotiated lead to high transaction costs. Transaction costs enter then in the decision over what level of asset specificity to invest in.

From this observation, this paper aims at better understanding the choice over conservation practices adoption differing in their asset specificity level. We base our analysis on the study of agri-environmental contract adoption by farmers. At the present time, adoption remains low and enrolled agri-environmental practices are low asset specific. Farmers actually avoid subscribing practices such as timely and site adapted conservation practices, specialized planting equipment, or advanced agronomic skills. Most of the time, these requirements leading the farmer to fully adapt his production system, they ends up to an important and long term investment. Moreover, the Government being the only demander of environmental services in rural areas, the value of these investments relies on the Government-farmer relationship. From this hold up situation and given that environmental outcomes highly depend on involved asset specificity levels, we therefore argue the asset specificity issue deserves more attention in the analysis of agri-environmental transactions.

Several studies have examined factors influencing farmers' agri-environmental contract adoption. Four main determinants have been identified, namely (i) farmer and farm household characteristics, (ii) farm biophysical characteristics, (iii) farm financial/management characteristics, and (iv) exogenous factors such as information availability, sources of information, society social capital (Knowler and Bradshaw, 2007). However, except from Bekele and Drake (2003), none have distinguished agri-environmental practices between them and their related adoption factors. As regard to Bekele and Drake's work, they studied farmers' choice over different soil and water conservation practices but did not distinguish them from their asset specificity level. This is what this paper aims at by analysing farmers' choice over different agri-environmental practices associated to different asset specificity levels.

We base our analysis on farmers' choice modelling. Facing agri-environmental practices differing in their asset specificity level, we assume each farmer selects the practice that maximises his utility. For that, the usual operational cost based analysis, i.e. the analysis of additional costs and profit foregone resulting from the technology adaptation to the commitment made, is completed by introducing to each agri-environmental practice their involved asset specificity level and associated transaction costs. Taking into account that transaction costs and asset specificity levels are endogenous in the farmer's decision, our analysis focused on exogenous transaction costs determinants, namely trust, bounded rationality, utility in the transaction, uncertainty and the similarity of transactions. Propositions are then derived to relate estimated effects of transaction cost exogenous determinants to chosen asset specificity levels.

This case study owes its originality to the policy compensation payment calculation. Being based on the 1999-Common Agricultural Policy (CAP) regulation, it only covers operational costs. Transaction costs are thus not included. With such a payment pattern and negligible transaction costs, all proposed compensated agri-environmental practices are expected to attract a good share of farmers. However, given that the different practices are associated to different asset specificity levels, farmers' transaction costs should differ across practices and therefore should affect each practice uptake rate.

The estimation of a multinomial logit model with data collected among 328 French farmers in 2005 first shows 1999-CAP compensation payments do not incite farmers to subscribe practices involving high asset specificity. Then, they clearly support that some factors favour the adoption of more specific practices, namely to trust in the Government, uncertainty and the similarity of transactions, i.e. how similar the new transaction technology is compared to existing ones. They support that the higher the farmer trusts in the Government, the higher the probability he chooses more specific practices. They also support, but in a less rigid way, that uncertainty stemming from the opacity of public decision making reduce the probability the farmer chooses more specific practices.

The first contribution of this paper is thus to highlight and support the importance of asset specificity in the choice over conservation practice adoption. The second contribution goes beyond the environmental field. Indeed, very few studies tried to take the asset specificity endogeneity into account whereas it is asserted (Masten, 1995; Masten and Saussier, 2002) that the specificity of assets is itself a decision variable. According to Masten and Saussier (2002), "the binding constraint is not technique, but data availability". This study beneficiating from an original data base, some information constraints are lowered, which places us in a position to provide empirical evidences on determinants of the choice over the asset specificity level.

In section 2, we present the model from which we derived propositions. Section 3 first introduces survey conditions and then provides estimation results. Section 4 concludes.

2. The conceptual framework and propositions

2.1. Asset specificity: Theory and evidence

Asset specificity is the most important and most distinguishes transaction costs economics from other treatments of economic organization. Transaction specific investments result in assets that have greater value when used to service a particular transaction, than they would have if that relationship broke down. This constitutes a hold up problem in which the economic relationship is characterized by the existence of appropriable quasi-rents[1] that are available to parties to bargain over. Besides, as noted by Williamson (1985), "asset specificity only takes on importance in conjunction with bounded rationality/ opportunism and in the presence of uncertainty". Therefore, when these conditions are gathered, transacting parties should be tempted to protect their relationship. They will be willing to write a contract as complete as possible, implement enforcement and monitoring designs,… which may lead to significant problems related to *ex ante* and *ex post* negotiations and maladaptation aspects and generate important transaction costs.

[1] The quasi-rent value of an asset is the excess of its value over its salvage value, that is, its value in its next best use to another renter. The potentially appropriable specialized portion of the quasi-rent is that portion, if any, in excess of its value in its second highest-valuing user (Klein et al., 1978)

Williamson is the first to note the role quasi rents can play in causing contracting problems and incentives to vertically integrate. This idea is then popularised in Klein et al., (1978). They emphasized on the presence of appropriable specialized quasi rents as likely producing a serious threat of opportunism and litigation which may turn out to be costly and ineffectual. They then assumed "as assets become more specific and more appropriable quasi-rents are created (and therefore the possible gains from opportunistic behaviour increases), the cost of contracting will generally increase more than the costs of vertical integration".

Four types of asset specificity are usefully distinguished, namely site specificity, physical asset specificity, human asset specificity and dedicated assets (Williamson, 1985). Masten et al. (1991) add time specificity as a fifth type, which particularly fits the agri-environmental transaction. It refers to the following case: "when timely performance is critical, delay becomes a potentially effective strategy for exacting price concessions. Knowing that interruptions at one stage can reverberate throughout the rest of the project, an opportunistic supplier may be tempted to seek a larger share of the gains from trade by threatening to suspend performance at the last minute. Even though the skills and assets necessary to perform the task may be fairly common, the difficulty of identifying and arranging to have an alternative supplier in place on short notice introduces the prospect of strategic hold ups".

Even if the transaction cost economics approach is not linked with formal models, it offers an "empirical success story" in the sense that many empirical tests flourished and confirmed propositions on (i) vertical integration (Joskow, 1985; Masten et al., 1991), (ii) long term contracts (Crocker and Masten, 1988; Joskow, 1985), or (iii) price adjustments (Crocker and Masten, 1991; Joskow, 1988). As regard to the literature on environmental service transactions, the presence of transaction costs has also been widely demonstrated (Colby, 1990; Stavins, 1995; Kuperan et al., 1998; McCann and Easter, 1999; Falconer et al. 2001). However, the specificity of assets is usually treated as an exogenous variable whereas it is itself a decision variable. According to Masten and Saussier (2002), "the binding constraint is not technique, but data availability". This is what be beneficiate in this present case study. Compensation payments not covering transaction costs borne by the farmer, we are in a position to compare the costs derived from the profit function with transaction costs. Then, by identifying conditions in which transaction costs vary, we could derive testable propositions about the choice over asset specificity level.

2.2. The model

We assume the farmer decides to adopt an agri-environmental contract with given agri-environmental practices and involved asset specificity levels if the offered contract payment is higher than compliance costs. Compliance costs gather technology adaptation costs derived from additional costs (also called operational costs), income foregone resulting from the commitment made and transaction costs borne by the farmer. In line with the 1999-CAP regulation, the implemented compensation payment (or contract payment) is a per-unit payment based on average operational costs and income foregone in each region and do not include transaction costs. Given that the asset specificity level associated to an agri-environmental practice is a factor of transaction costs, the variability of transaction costs from a practice to another is thus expected to affect their respective uptake rate, *ceteris paribus*. Farmers should then choose the agri-environmental practice which involves the lowest transaction costs. In addition, we suspect some conditions to lower or increase these transaction costs and, consequently, to impact on farmers' choice.

As implied by this choice framework, we consider a utility maximizing farmer facing K agri-environmental practices, each of them being linked to an asset specificity level. The farmer selects the K-dimensional vector y of agri-environmental service units derived from each practice according to his preferences and budget constraint. The agri-environmental contract lasts five years corresponding to a medium term time horizon. Offered per-unit payments are included in the K-dimensional vector q. Utility is supposed to be non decreasing, continuous, differentiable and quasi-concave in the private consumption m and the vector y. Utility also depends on exogenous farmer's preferences. In the budget constraint, the medium term income m can not exceed the contract payment $q.y$ plus the short term profit $\pi(.)$ that depends on y and on prices of variable inputs and outputs p. The short term $\pi(p,y)$ dually represents the technology. It is assumed linearly homogenous in prices p, non increasing and quasi-concave in y (Dupraz et al., 2003). A transaction cost function, called $T(.)$, is distinguished from the profit function. This function is assumed to depend on exogenous determinants of transaction costs, t.

$$\begin{aligned}
&\underset{m,y}{Max}\, U(m,y) \\
&m \leq \pi(p,y) - T(p,y,t) + qy \qquad (1) \\
&y \geq 0
\end{aligned}$$

As previously explained, the profit variation due to the farm technology adaptation is compensated by the contract payment, but it does not encompass transaction costs. Therefore, when asset specificity gets higher, we should observe effects stemming from the variability of transaction costs and utility only. Effects stemming from the profit function are thus theoretically non observable.

The solution of the maximisation programme (1) is noted (m^*, y^*), with $V(p,q,t) = U\big(m^*(p,q,t), y^*(p,q,t)\big)$ being the indirect utility function. The vector y^* is the optimal combination of agri-environmental practices, in other words, the global asset specificity level selected by the farmer. Given the very high number of practices, which leads to a large spectrum of possible practice combinations, this decision making process is difficult to estimate directly. Therefore, to derive a tractable econometric specification, we assume a two stage decision making process, based on a partition Z of all possible combinations of practices distributed into J groups of practice combinations noted Z_j. The partition includes groups of non compensated practices. These groups differ according to the asset specificity associated with the corresponding combinations of practices. Within each group, the maximal utility is:

$$V(p,q,Z_j) = \underset{m,y}{Max}\left\{U(m,y); m \le \pi(p,y) + q.y; y \in Z_j\right\} \tag{2}$$

It follows that:

$$V(p,q) = \underset{Z_j}{Max}\left\{V(p,q,Z_j); Z_j \in Z\right\} \tag{3}$$

We consider i^{th} farmer's decision to be associated to the maximization program (3). His maximal indirect utility for the group Z_j is noted V_{ij} and is the solution of program (2). The econometric specification then relies on a random utility model:

$$V_{ij} = b_j x_i + u_{ij}$$
$$\forall j = 1,...,J \qquad (4)$$

Where x_i is the vector of explanatory variables describing the exogenous determinants of farmer i's choice. Assuming p and q do not change during the contract duration and accross farmers, x_i is thus the vector of factors of transaction costs and utility (effects stemming from the profit function being theoretically non observable). b_j are the corresponding parameters to be estimated and u_{ij} a perturbation which is assumed to have a Gompertz distribution ($F(u_{ij}) = \exp(-\exp(-u_{ij}))$). Perturbations are assumed independent and identically distributed.

Let d_{ij} be the dichotomous variable describing farmer i's choice over the different conservation practice combinations j. The decision rule is then:

$$d_{ij} = 1 \quad if \;\; V_{ij} > V_{ij'} \quad \forall j' \neq j$$
$$d_{ij} = 0 \qquad otherwise \qquad (5)$$

Relations (4) and (5) specify a multinomial logit model where the probability of the i^{th} farmer to select a combinations j is given by (6):

$$P_{ij} = \Pr\{d_{ij} = 1\} = \frac{\exp(x_i\,'b_j)}{\sum_{j'=1}^{J} \exp(x_i\,'b_{j'})} \qquad \forall j \qquad (6)$$

2.3. Conditions for choosing more specific assets

This section aims at determining factors affecting farmers' choice. From the above specified model, these factors may theoretically not only impact on farmers' transaction cost function but on his utility and profit functions too. We here present propositions about these factors effects on these two functions and on the overall probability the farmer chooses higher specific practices. The theoretical and empirical transaction cost economics literature provides us with five relevant determinants. Three of them seem to impact on the transaction cost function only and allow conclusions whereas two have more complex effects.

2.3.1. Factors impacting on the transaction cost function only

Trust

As defined in Sako and Helper (1998), trust is an expectation held by an agent that its trading partner will behave in a mutually beneficial manner. For simplification, we will consider trust as the opposite of opportunism. A lack of trust may stem from the fear the co-contracting party might try to take unfair decisions, or suspicion on his use of given information, or distrust arising from non shared goals. According to Hwang (2006), a deterioration of trust exhibits a negative relationship to the willingness to make specific investments. Trust is thus expected to reduce the hold up pressure on the transacting parties. Consequently, we expect them to be less tempted to protect their relationship and we should observe a lower magnitude of transaction costs, other things being equal. Our proposition is straight forward.

Proposition 1: The more the farmer trusts in the Government, the lower the magnitude of transaction costs and the higher the probability he chooses more specific assets, *ceteris paribus*.

Bounded rationality

According to Williamson (1985), bounded rationality is a semi-strong form of rationality in which economic actors are assumed to be “intendedly rational, but only limitedly so” (Simon, 1961, p.xxiv). Bounded rationality implies “economic agents do not know all the solutions to the problems they face, are unable to calculate the possible outcomes of these solutions, and cannot perfectly arrange these outcomes in order in their space of preferences. With regard to contracts, this means that they are unable to design the optimal solutions (behavioral rules) taking into account every relevant contingency without high, and sometimes prohibitive, costs and delays” (Brousseau and Fares, 2000). Therefore, if we assume decisions are time-consuming and costly and that agents can make mistakes, we can acknowledge more bounded rationality lead to more transaction costs, and we suggest the following proposition on the relationship between asset specificity and bounded rationality.

Proposition 2: The more the farmer has a bounded rationality, the higher the magnitude of transaction costs and the lower the probability he chooses more specific assets, *ceteris paribus*.

Uncertainty

Following Carson et al. (2006), uncertainty may be associated to disturbances from two different origins, namely volatility and ambiguity. Volatility refers to "the rate and unpredictability of change in an environment over time, which create uncertainty about future conditions". This conceptualization of uncertainty follows Williamson's (1985) one. Ambiguity refers to the metering problem, i.e. "the degree of uncertainty inherent in perceptions of the environmental state irrespective of its change over time". Here, we associate uncertainty to volatility aspects. Saussier's 2000 study then gives insight into the relationship between uncertainty and transaction costs, namely "the greater the uncertainty level of the transaction, the more difficult, expensive, and risky it will be to establish a contract that aims for completeness". Therefore, our proposition about the relationship between asset specificity and uncertainty is as follow.

Proposition 3: The more uncertainty surrounds the agri-environmental transaction, the higher the magnitude of transaction costs and the lower the probability the farmer chooses more specific assets, *ceteris paribus.*

2.3.2. Factors with more complex effects

Utility in the transaction

In the case of public good transactions, non rivalry makes it possible for the farmer to derive utility from both the service he produces and the payment he receives accordingly. Utility in the transaction thus refers to the total value the farmer gives to environmental services he produces from the investments he decides to make. We argue this utility has two consequences. First, it may lead the farmer to have a positive willingness to pay for environmental services. An increased utility due, for instance, to environmental awareness or the presence of children, should thus reduce the compensation payment necessary to incite the farmer to enrol (Dupraz et al., 2003). Second, from the asset specificity perspective, it provides an alternative value to specific investments outside the transaction with the Government and, consequently, should reduce the appropriable quasi-rent. Therefore, the hold-up pressure should be reduced and transaction costs dedicated to protect the relationship should be lower. From this second observation, we derive the following proposition:

Proposition 4: The more utility the farmer gets from environmental services he produces through the agri-environmental contract, the lower the magnitude of transaction costs and the higher his willingness to pay for environmental services. Since both effects are non distinguishable, it is not possible to conclude on the effect of utility in the transaction on the probability the farmer chooses more specific assets.

Similarity of transactions

The similarity of transactions can be defined as "those transactions that are similar to ones in which the firm is already engaged" (Masten et al., 1991). This characteristic has a double impact. On transaction costs through internal organization costs, and, on the profit function through economies of scale and scope. Internal organization costs are the costs of organizing and losses through management decision mistake. Coase (1937) and Masten et al. (1991) assert that internal organization costs increase with an increase in the dissimilarity of transactions. Therefore, the costs related to efforts to adapt the farming production technology and management decisions with the agri-environmental transaction will be higher when the farmer is unfamiliar with what he commits. Masten et al.'s study then set a relationship between the similarity of transactions and the specificity of involved investments by observing that "workers with more specific skills are less costly to manage". They went to the conclusion that human specific assets were reducing internal organization costs. The objective of reducing internal organization costs may therefore be a reason for choosing more specific assets. By impacting on internal organization costs, the similarity of transaction may thus be a determinant of the choice over asset specificity. As regard to the similarity effect on the profit function, we argue that an activity the farmer is familiar with is technically close to other activities he is already having or used to have and should therefore produce economies of scale and/or scope[2]. However, the compensation payment being calculated on technology adaptation costs and thus taking economies of scale and scope into account[3], estimations are expected not to capture the economy of scale and scope effect but the effect of internal organization costs only.

[2] In other respects, Lyons (1995) observed a relationship between asset specificity and economies of scale and scope. He showed that "economies of scale and scope are a significant motivation behind the decision to buy-in, but only in the absence of specific assets", and that "specific assets are the overriding influence when scale or scope economies exist".

[3] Compensation payments are per-region calculated.

Proposition 5: The more the agri-environmental transaction is similar to ones he is already engaged, the lower the internal organization costs and the higher the probability the farmer chooses more specific assets, *ceteris paribus*.

3. Agri-environmental contracts: an empirical test

Propositions were tested using data from a 2005 survey covering the Basse-Normandie region in France. Within the survey area, 328 farmers were face to face interviewed. Among them, 171 are contracting farmers and 157 are non contracting ones. The sample is quite representative although contracting farmers are over represented on purpose in order to get better information on contracts. This section first gives insight into the characterization of practice asset specificity levels. Then, after having presented explanatory variables, estimation results are provided.

3.1. Characterizing practice asset specificity levels

In the agri-environmental transaction asset specificity may appear in three contexts. First, for environmental outcomes to be gained, most agri-environmental practices must be operated on proper periods as a function of meteorological conditions and natural cycles. In the same line, Allen and Lueck (1998) and many agricultural economists (for example, Brewster, 1950; Castle and Becker, 1962) argue "seasonality is the main feature that distinguishes farm organization from "industrial" organization". Even if skills and assets necessary to perform these tasks are common, it is very difficult for the Government to turn to an alternative supplier in place on short notice, which may introduce strategic hold up. In addition of being dependant on time aspects, environmental outcomes depend on agri-environmental practice localization too, which constitutes a second source of asset specificity. As for time specificity, skills and investments are easily redeployable, but environmental goals can't be reached if these tasks are implemented elsewhere. This is thus another opportunity for hold up.

It is important to note both hold up cases mostly concern the Government in that he should not be bargaining from a position of strength. However, these time and site requirements bring the farmer to fully adapt his farming production system and may lead him to be required to improve his agronomic knowledge and his material park. This new production system management is an important investment for the farmer, which has currently no other uses outside the agri-environmental contract with the Government. The farmer thus becomes taken in a hold up position too. Finally, the third origin of asset specificity stems from human skills. Practices aiming at biodiversity or extensive management goals such as low pesticide inputs require advanced agronomic and ecological knowledge which does not find other valuable uses outside the transaction with the Government. This constitutes another hold up case as regard to the farmer point of view.

In our case study, farmers willing to subscribe an agri-environmental contract had the possibility to choose one or more agri-environmental practices among a set of about 170 different practices. Our sample of contracting farmers accounts for 45 different practices and thus includes a high number of practice combinations. For simplification, we distributed these combinations into five practice combination groups[4]. These groups were created with a classification method. The hypothesis under this classification is that choices are mutually exclusive. Table 1 presents these practice combination groups.

Table 1: Description of practice combination groups

Practice combination groups	Nb. of farmers	Description
A1	68	Important changes on meadows and landscape
A2	20	Fauna protection
B	43	Changes on arable lands and meadows
C1	28	Practice maintenance on meadows
C2	12	Changes on arable lands
D1	76	More than 4 non paid actions
D2	81	Less than 3 non paid actions

From these practice combination groups, we distinguished three asset specificity levels.

Practice combination group A call for assets which we consider as highly specific. A1 refers to constraining commitments such as production system reconversion towards grazing systems, extensive management of meadows and landscape maintenance. These practices lead the farmer to rethink his whole farming system so as to be able to honour his commitment in terms of dates, input quantities and practice localization. In addition, practices concerning landscape maintenance such as hedgerows or ponds, require a certain level of agronomical and botanical expertise, which involves the farmer to get advanced knowledge in these fields. These different investments do not have any value outside the agri-environmental contract. This is why A1 is assumed to be a highly specific practice combination group. A2 group focuses on fauna protection. This entails timing restrictions for certain operational tasks, such

[4] These practice combination groups are specified by j in the econometric model.

as mowing or ploughing, depending on natural cycles and ecological expertise. As for A1 group, these investments do not have any value outside the agri-environmental contract.

Practice combination group C calls for low asset specificity. C1 group only concerns extensive management of meadow practices. It does not entail constraining requirements in terms of date, input quantities and practice localization, which does not lead the farmer to entirely change his farming system and thus to invest in a new production system management. C2 group is different from C1. C2 group entails changes on arable lands, such as covering bare lands in winter, and restrictions on pesticide and fertilizer input management, which lead the farmer to entirely revise his production system. This involves the farmer to highly invest in order to commit with his contract. However, contrarily to A groups, these investments are redeployable on other transactions, namely quality labels and the new orientation of the Common Agricultural Policy. Indeed, the last CAP regulation calls for ecoconditionality requirements, among which, winter bare lands management, pesticide and fertilizer inputs requirements are included.

Practice combination group B calls for average specificity. It is similar to C1 group but requirements are more numerous and lead to higher investments. Some of them, such as covering bare lands in winter are redeployable, as referred to the new CAP regulation, but others are not.

Moreover, given that non contracting farmers may implement non compensated conservation practices, we added up two non compensated practice combination groups, namely D1 and D2. D1 includes combinations of more than 4 non compensated conservation practices, and D2 includes combinations of less than 3 specified practices, including none. In both groups, involved assets are assumed not to show any specificity.

It is finally necessary to stress that the gradient of specificity levels among enrolled practices is narrower than the 170 initially proposed practices' one. To be more precise, farmers have chosen the less specific practices whereas proposed practices encompassed a whole gradient of practices from very specific ones, such as converting arable lands into meadows, to non specific ones such as winter covering of arable lands. This will have to be taken into account in the interpretation of the results.

3.2. Explanatory variables

In order to capture the notion of previously described determinants, several types of variables were collected. They concern the farmer (education level, environmental awareness…), his production system (farm legal status, number of Full Time Equivalent workers…), his professional environment (involvement in agricultural organizations, administrative and technical external services,…) and his relationship with the Government (trust in administrations, …). From these raw data, we created variables providing a measure of asset specificity determinants as presented in table 2.

Table 2: Determinants of asset specificity and their respective explanatory variables

Determinants of asset specificity	Related constructed explanatory variables	Variable values
Bounded rationality	Agricultural education (***AGRI EDUC***) General education	6 classes 7 classes
Trust	To trust the implementation process of agri-environmental contracts (***TRUST IMPL***) Strong belief in the Government goodwill (***GOODWILL***)	Continuous variable [-1;1] Continuous variable [-1;1]
Uncertainty	To regularly receive technical and administrative advices (***ADVICES***) To be involved in an agricultural organization (***ORGA***)	Continuous variables [-1;1] Continuous variable [-1;1]
Similarity of transaction	Grassland share (***GRASSLAND***) Farm land area (***UAA***) Arable land share Labor (***FTE***) Animal population Milk quota Production system type (organic or conventional)	Continuous variable (%) Continuous variable (hectares) Continuous variable (%) 5 classes Continuous variable (Livestock units) Continuous variable (litre) 0=organic; 1=conventional
Utility	Environmental awareness (***ENV AW***) Children Free time dedicated in nature related hobbies	Continuous variable [-1;1] 3 classes Continuous variable [-1;1]
Control variables		
Changes in the production system in the last 5 years (***CHANGES***) To have already enrolled an agri-environmental contract (***EXPERIENCE***) Age (***AGE***) NUT region Machinery ownership Land share in ownership Land share in long term tenant tenure Land share in short term tenant tenure Farm legal status		Continuous variable [-1;1] 0=no; 1=yes 3 classes 0=Calvados;1=Manche; 2=Orne Continuous variable [-1;1] Continuous variable (%) Continuous variable (%) Continuous variable (%) 5 classes

Trust variables were created with a Multiple Correspondence Analysis from farmers' opinions (strongly disagree; somewhat disagree; somewhat agree; strongly agree; do not know) on statements such as "the eligibility rules are fair", or "the sanctions for not carrying out the contract are reasonable". These statements tend to describe farmers' expectation that the Government will behave in a mutually beneficial manner (cf. section 2.3.1). Then, for each created variable, we assumed a positive TRUST IMPL, for instance, indicates the farmer trusts in the Government, and that the higher it gets, the more the farmer trusts in the Government. The same method was used for uncertainty and utility variables.

Bounded rationality was measured with qualitative variables by creating classes of variables. Variables describing farmers' education were assumed to measure their rationality since education is expected to provide solutions to problems and unable farmers to calculate the possible outcomes to these solutions. It was than assumed that the higher the education level, the less bounded the farmer's rationality.

We measured the similarity of transactions in the same way as Masten et al. did in their 1991 article. They compared the initial low-technology and labor intensive tasks with the integration of high engineering-intensive tasks. Here, the similarity of transaction is measured from the characteristics of the farm production technology (continuous variables) and the technology required by the different conservation practices. For instance, the practice "extensive management of meadows", will be qualified as similar to extensive grazing production systems whereas it will be different from a maize oriented production system.

3.3. Estimation results

Parameter estimates are gathered in table 3. Significant variables are presented only. The model has kept all observations. The reference contract is D2, which is the category of farmers implementing less than 3 non compensated conservation practices. The reference farmer has an agricultural education level superior than the primary level[5] and has not subscribed an agri-environmental contract in the past. As regard to continuous variables, we took average values (grassland share is 53.65%, farm land area is 93.69ha. The model adjustment quality is medium as the Mc Fadden R^2 is 33.55.

[5] Certificat d'Aptitude Professionnelle

Table 3: Logit multinomial estimations

Variable	A1	A2	B	C1	C2	D1
Constant	**-1,91**** ***(0,87)***	**-6,15***** ***(2,07)***	**-2,30***** ***(0,91)***	**-6,17***** ***(1,75)***	-1,31/ *(1,97)*	-0,24/ *(0,55)*
UNCERTAINTY						
ADVICES	0,28/ *(0,29)*	-0,13/ *(0,56)*	0,18/ *(0,29)*	**0,98**** ***(0,48)***	**1,40**** ***(0,76)***	0,001/ *(0,22)*
ORGA	**0,49**** ***(0,25)***	0,22/ *(0,50)*	0,38/ *(0,29)*	-0,05/ *(0,39)*	0,62/ *(0,44)*	0,10/ *(0,23)*
SIMILARITY						
UAA	**0,01**** ***(0,005)***	0,01/ *(0,009)*	**0,008*** ***(0,005)***	**0,01**** ***(0,008)***	0,006/ *(0,01)*	**0,007*** ***(0,003)***
GRASSLAND	**0,01**** ***(0,008)***	0,02/ *(0,02)*	0,01/ *(0,01)*	**0,05***** ***(0,02)***	-0,15/ *(0,11)*	-0,005/ *(0,006)*
TRUST						
TRUST IMPL	**1,61***** ***(0,31)***	**2,17***** ***(0,68)***	**1,26***** ***(0,31)***	**1,59***** ***(0,38)***	**2,20**** ***(1,06)***	0,22/ *(0,22)*
GOODWILL	**0,41*** ***(0,24)***	**0,62*** ***(0,41)***	**0,44*** ***(0,27)***	0,45/ *(0,38)*	-0,18/ *(0,79)*	-0,06/ *(0,22)*
UTILITY						
ENV AW	-0,23/ *(0,21)*	**-1,10*** ***(0,69)***	-0,48/ *(0,46)*	-0,24/ *(0,34)*	-2,74/ *(2,14)*	0,22/ *(0,19)*
BOUNDED RATIONALITY						
LOW AGRI EDUC	**0,67*** ***(0,48)***	**2,06**** ***(0,91)***	**0,86*** ***(0,55)***	0,19/ *(0,72)*	1,66/ *(1,59)*	0,29/ *(0,42)*
CONTROL VARIABLES						
CHANGES	**0,52*** ***(0,30)***	**1,60*** ***(0,93)***	**1,12***** ***(0,33)***	-0,04/ *(0,45)*	-0,39/ *(1,31)*	**0,39*** ***(0,22)***
EXPERIENCE	**-1,69***** ***(0,72)***	**1,89***** ***(0,83)***	**-1,84*** ***(1,10)***	-0,27/ *(0,63)*	1,99/ *(1,96)*	-0,65/ *(0,47)*

In the light of our propositions, six variables have expected signs. They describe uncertainty ("to regularly receive technical and administrative advices" and "to be involved in an agricultural organization"), trust ("to trust the implementation process of agri-environmental contracts" and "strong belief in the Government goodwill") and the similarity of transactions ("grassland share" and "farm land area"). Among them, variables describing trust clearly distinguish contractors from non contractors and let us think that trust has an important role in farmers' decision to enroll and invest in the production of environmental services. This result highly supports the existence of a transaction costs barrier in the adoption of agri-environmental contracts. This may explain why farmers enrolled practices associated to rather low specificity levels compared to what was initially possible to choose.

The variability of parameters is presented in table 4.

Table 4: Marginal effects (%)

Variables	A1	A2	B	C1	C2	D1	D2
UNCERTAINTY							
ADVICES	0,50 *(2,70)*	-1,59 *(1,49)*	-0,43 *(2,41)*	**5,17** ***(1,68)***	2,48 *(1,93)*	-3,09 *(2,88)*	-3,06 *(2,83)*
ORGA	**4,34** ***(2,22)***	-0,06 *(1,51)*	1,34 *(1,94)*	-1,91 *(1,99)*	0,78 *(1,39)*	-1,42 *(2,95)*	-3,06 *(2,72)*
SIMILARITY							
UAA	0,03 *(0,04)*	0,01 *(0,02)*	0,01 *(0,04)*	0,05 *(0,03)*	0,00 *(0,02)*	0,02 *(0,05)*	**-0,12** ***(0,05)***
GRASSLAND	0,12 *(0,09)*	0,03 *(0,05)*	0,06 *(0,08)*	**0,26** ***(0,07)***	-0,30 *(0,29)*	-0,12 *(0,13)*	-0,06 *(0,1)*
TRUST							
TRUST IMPL	2,43 *(2,99)*	1,27 *(1,29)*	2,16 *(2,34)*	1,12 *(1,78)*	-0,66 *(2,14)*	**-3,94** ***(2,66)***	-2,39 *(2,48)*
GOODWILL	**9,50** ***(2,47)***	**4,06** ***(1,33)***	2,15 *(2,62)*	**3,43** ***(1,69)***	2,85 *(1,60)*	**-9,27** ***(2,57)***	**-12,72** ***(2,55)***
UTILITY							
ENV AW	0,97 *(5,78)*	-3,28 *(4,62)*	-2,68 *(4,49)*	0,01 *(2,85)*	-5,12 *(3,40)*	**7,96** ***(3,98)***	2,15 *(3,98)*
BOUNDED RATIONALITY							
LOW AGRI EDUC	0,75 *(5,56)*	**6,85** ***(1,92)***	3,03 *(4,58)*	-2,66 *(2,76)*	2,50 *(2,13)*	-2,86 *(4,27)*	**-7,62** ***(3,91)***
CONTROL VARIABLES							
CHANGES	-0,17 *(2,68)*	**4,34** ***(1,79)***	**7,18** ***(2,67)***	**-3,64** ***(1,72)***	-1,60 *(1,95)*	0,73 *(3,02)*	**-6,84** ***(2,05)***
EXPERIENCE	**-16,15** ***(4,07)***	**18,98** ***(5,13)***	**-10,62** ***(3,60)***	1,86 *(4,18)*	-2,31 *(1,98)*	-3,23 *(6,73)*	**11,46** ***(5,85)***

From the six expected variables, “goodwill trust in the Government” and “to be involved in an agricultural organization” show higher coefficients for combination group A. They thus support that, first, the higher the farmer trusts in the Government, the higher the probability he chooses specific assets, second, the less uncertainty surrounds the agri-environmental transaction, the higher the probability the farmer chooses specific assets. In addition, the similarity of transactions has a significant positive impact on farmers’ choice towards specific practices by reducing internal organization costs, but coefficients across practices do not allow to confirm our proposition. On the other hand, these coefficients being very low, they show technology characteristics have nearly no effect on farmers’ choice. This last observation supporting contract payments do compensate farmers for technology linked costs but do not for asset specificity linked costs.

Beyond these observations, how to explain these six variables have “discontinuous” effect? For instance, “to be involved in agricultural organizations” has a higher and significant effect on the specific combination group A1 but has a non significant and negative effect on A2. The significancy effect is easily explained from the number of observations in group A1 (68 observations) and A2 (20 observations) (cf. table 1). The coefficient difference may come from the fact that contracts in the same asset specificity level category are not homogenous on other significant aspects.

Another discontinuous effect regards the variable "to receive regularly technical and administrative advices". It only impacts on the non specific combination group C1. This isolated effect may come from the fact that C1 requirements corresponds to the CAP orientation for the next coming years whereas the future of other contract types is far more uncertain. It is thus normal to observe that well informed farmers will prefer to enroll conservation practices whose payment is less uncertain for a longer period.

Concerning variables describing the similarity of transactions and more particularly "grassland share", whose effect is observable for the non specific combination group C1 only, the explanation is certainly to be found in the compensation payment. Indeed, since it is calculated on average operational costs and profit foregone per region, the economy of scale and scope effect may be captured too in estimations. Following this reasoning, we should observe similar effects of the "grassland share" variable on both C1 and C2 groups, but, this is not the case. This may come from the number of observations and the fact that combination groups C differ in the technology they call. It is thus non surprising to observe that C2, which calls for non grassland farm technology, is not chosen by farmers with a high grassland share.

As regard to non expected variables in table 3, "environmental awareness", which has a non expected effect in table 3, has an expected effect in table 4 since it increases the probability the farmer implements non compensated conservation practices. This effect may be explained from the fact that environmental awareness is an overriding factor for non-contracting farmers to implement environmental friendly actions, whereas it is "competing" with other significant factors, such as the compensation payment, for contracting farmers. The other non expected variables find explanations from missing characteristics describing whether the farmer or the combination group.

To have a lower agricultural education has no effect on contracting farmers and a positive one on A2 contractors. This is explained from the characteristics of the agricultural education which used to be oriented towards productivity and did not give much attention to "green" production technologies.

Evolving production systems, observable through "changes in the production system in the last five years", have a lower probability to enrol combination group C1. The explanation has to be found in the contract technology requirements which correspond to farm production systems already existing: farms with high a grassland share. The variable “grassland share” supports this observation showing these farms have a higher probability to enrol combination group C1. It is thus expected these farms are not in a dynamic of change since what C1 group requires is what they are already doing.

Finally, the negative effect of the variable “to have already enrolled an agri-environmental contract” is easily explained from contract implementation dates. Indeed, except from combination group A2, which originated in the 1992-reform of the Common Agricultural Policy, they all stem from the 1999-reform. Therefore, farmers with combination group A2 could commit on a longer period than others. We also observe this variable to have a non expected effect on D2. There are two possible explanations. Whether D2 farmers did enrolled an agri-environmental contract and remain disappointed, or, they were not eligible anymore.

4. Conclusion

The purpose of this paper was to identify conditions favouring farmers’ choice towards specific assets and to test propositions on these determinants. Results led to the conclusion that farmers’ trust in the Government appears to be the most robust determinant of the choice toward more specific practices. First, it distinguishes contracting farmers from non contracting farmers whereas variables describing the technology were expected to explain farmers’ behaviours but did not. Second, it highly supports the existence of a transaction costs barrier in the adoption of agri-environmental contracts, which may explain why farmers enrolled practices associated to rather low specificity levels. Finally, coefficients across practices allow to support that the higher the farmer trusts in the Government, the higher the probability he chooses specific assets. In addition to trust, the effect of uncertainty was also observed to negatively impact on farmers’ choice towards more specific practices.

Keeping as an objective the production of environmental services in rural areas and low production costs, i.e. to enhance the adoption of agri-environmental practices involving specific assets, this study provides new outcomes for policy design. It particularly highlights the role of asset specificity and implied transaction costs in the choice over different conservation practices. In addition, by identifying factors favouring the adoption of specific investments, recommendations are derivable to direct the Government towards actions on these factors. For instance, knowing that farmers’ trust in the implementation process has a major role, the Government may work on the clarity of contract requirements so as to narrow its implementation interpretation spectrum. Trust may also be restored by balancing the Government and the farmers' rights when a case is brought to private negotiation or to court. Finally, as regard to the uncertainty aspect, the Government could improve its communication policy in order to reduce the opacity of its political actions. In practice, a better communication may go through an improved coordination between Government agencies or a merging of agencies responsible for writing contracts, signing and paying.

References

Allen, D.W., Lueck, D. (1998). The Nature of the Farm. *Journal of Law and Economics*, 41(2): 343-386.

Bekele, W., Drake, L., (2003). Soil and water conservation decision behaviour of subsistence farmers in the Eastern Highlands of Ethiopia: a case study of the Hunde-Lafto area. *Ecological Economics*, 46: 437-451.

Brewster, J.M. (1950). The Machine Process in Agriculture and Industry. *Journal of Farm Economics*, 32: 69-81.

Brousseau, E., Fares, M. (2000). Incomplete Contracts and Governance Structures: Are incomplete Contract Theory and New-Institutional Economics Substitutes or Complements?. In: C. Ménard (Ed), *Institutions, Contracts and Organizations, Perspectives from New-Institutional Economics*. Edward Elgar Pub.

Carson, S. J., Madhok, A., Wu, T. (2006). Uncertainty, Opportunism, and Governance: the Effects of Volatility and Ambiguity on Formal and Relational Contracting. *Academy of Management Journal*, 49(5): 1058-1077.

Castle, E.N., Becker M.H. (Ed), (1962). *Farm Business Management*. MacMillan, New York.

Coase, R.H., (1937). The Nature of the Firm. *Economica*, 4: 386-405.

Colby, B., (1990). Transaction costs and efficiency in western water allocation. American *Journal of Agricultural Economics*, 72: 1184-92.

Crocker, K.J., Masten S.E. (1988). Mitigating Contractual Hazards: Unilateral Options and Contract Length. *Rand Journal of Economics*, 19: 327-343.

Crocker, K.J., Masten, S.E. (1991). Pretia ex Machina? Prices and Process in Long-Term Contracts. *Journal of Law and Economics*, 34: 69-99.

Dupraz, P., Vanslembrouck, I., Bonnieux, F., Van Huylenbroeck, G. (2002). *Farmers' participation in european agri-environmental policies*. Presented at X Congress of EAAE, August 28th – 31st 2002, Zaragoza

Dupraz, P., Vermersch, D., Henry de Fraham, B., Delvaux, L. (2003). The environmental supply of farm households: A flexible willingness to accept model. *Environmental and Resource Economics*, 25(3): 171-189.

Falconer, K., Dupraz, P., Whitby, M. (2001). An investigation of policy administrative costs using panel data for the English environmentally sensitive areas. *Journal of Agricultural Economics,* 52 (1): 103-883.

Gould, B.W., Saupe, W.E, Klemme, R.M. (1989). Conservation tillage: the role of farm and operator characteristics and the perception of soil erosion. *Land Economics*, 65(2): 167-182.

Hwang, P. (2006). Asset specificity and the fear of exploitation. *Journal of Economic Behavior and Organization*, 60: 423-438.

Joskow, P.L. (1985). Vertical Integration and Long-Term Contracts: The case of Coal-Burning Electric Generating Plants. *Journal of Law, Economics and Organization*, 1: 33-80.

Joskow, P.L. (1988). Price Adjustment in Long-Term Contracts: The Case of Coal. *Journal of Law and Economics*, 31: 47-83.

Klein, B., Crawford, R.A., Alchian, A.A. (1978). Vertical integration, appropriable rents, and the competitive contracting process. *Journal of Law and Economics*, 21: 297-326.

Knowler, D., Bradshaw, B. (2007). Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy*, 32: 25-48.

Kuperan, K., Abdullah, N. M. R., Pomeroy, R.S., Genio, E.L., Salamanca, A.M. (1998). *Measuring transaction costs of fisheries co-management. Marine Resource Economics*, 13, 103–114

Masten, S.E. (1995). Empirical research in transaction costs economics: challenges, progress, directions. In: Groenewegen, J. (Ed), *Transaction Cost Economics and beyond*. Kluwer, Amsterdam.

Masten, S.E., Meehan, J. W., Snyder, E. A. (1991). The Costs of Organization. *Journal of Law, Economics and Organization*, 7: 1-27.

Masten, S.E., Saussier, S. (2002). Econometrics of contracts: an assessment of developments in the empirical litterature of contracting. In: E. Brousseau and J.M. Glachant (Ed), *The Economics of Contracts: Theories and Applications*. Cambridge University Press, Cambridge, pp 273–292.

McCann, L., Easter, K.W. (1999). Evaluating transaction costs of nonpoint source pollution policies. *Land Economics*, 75 (3): 402-414.

Napier, T.L., Camboni S.M. (1993). Use of conventional and conservation practices among farmers in the Scioto River basin of Ohio. *Journal Soil and Water Conservation*, 48(3): 231-237.

Sako, M., Helper, S. (1998). Determinants of trust in supplier relations: evidence from the automotive industry in Japan and the United States. *Journal of Economic Behavior and Organization,* 34: 387-417.

Saussier, S. (2000). Transaction costs and contractual completeness. *Journal of Economic Behavior and Organization*, 42: 189–206.

Simon, H.A. (1961). *Administrative behaviour. 2d ed*. Macmillan, New York. Original publication: 1947.

Soule, M.J., Tegene, A., Wiebe, K.D. (2000). Land tenure and the adoption of conservation practices. *American Journal of Agricultural Economics*, 82(4): 993-1005.

Stavins, R.N. (1995). Transaction costs and tradable permits. *Journal of Environmental Economics and Management*, 29 (2): 133-148.

Traoré, N., Landry, R., Amara, N. (1998). On-farm adoption of conservation practices : the role of farm and farmer characteristics, perceptions, and health hazards. *Land Economics*, 74(1): 114-127.

Williamson, O.E. (1985). *The Economic Institution of Capitalism- Firms, Markets and Relational Contracts*. The Free Press, New York.

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