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Identifying additional barriers in the adoption of agri-environmental schemes: The role of fixed costs

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ABSTRACT

Agri-environmental schemes (AES) are the main policy instrument currently available in the EU to promote environmentally friendly farming practices. However, the degree of uptake in some areas is extremely low. In order to better understand this low uptake rate, this paper develops a profit maximiser theoretical framework which takes into account the potential presence of fixed costs when applying to an AES based on introducing an alternative cropping system (alfalfa). Estimation results show that there is an adoption barrier derived from the lack of know-how of the new crop that affects the fixed compliance costs. In addition, there is an adoption barrier derived from the contract transaction costs which are reduced in the presence of social networks.

Introduction

Agri-environmental schemes (AES) are the main policy instrument currently available in the European Union to foster improvements in the relationship between agriculture and the environment. Over 38 million hectares (20.9% of the total Utilized Agricultural Area) were under some kind of AES in the EU-27 in 2009 with an overall budget spending of 22 billion € in EU public funds being allocated to this policy for the period 2007–2013 (DG AGRI, 2012). Payment levels for each AES are calculated based on supply side approaches, aiming at compensating forgone profits and additional costs (article 39–4, Regulation 1698/2005). Formerly, under Agenda 2000, a 20% incentive was foreseen in some cases. This option has been removed for the current programming period although transaction costs, if necessary, can also be compensated for.

Prior research has identified that premiums based on forgone profit might not be sufficient to assure farmer participation. Cooper and Signorello (2008) show how risk-related issues can require premiums to more than cover the mean loss in profit associated with adoption. They back their theoretical assumption estimating this additional payment comparing contingent valuation estimates of willingness to accept with actual forgone profits. Additionally Barreiro-Hurlé et al. (2009a) have shown that sign-up decision is not solely affected by farm technical characteristics but also influenced by the farmer social capital (measured as the social farmer network and participation), thus identifying the limited effect of premiums in fostering adoption, especially for low requirement measures. These results point at the fact that even the 20% incentive was not sufficient to foster AES sign-up, thus partially explaining the low enrolment rates detected throughout the EU for AES. While Austria, Finland and Luxembourg have more than two thirds of the UAA (Utilised Agricultural Area) involved in agri-environmental measures; in Belgium, Denmark, Greece, the Netherlands and Spain the coverage is just a mere 5% of their total UAA (Glebe and Salhofer, 2007).

This paper study the potential adoption barrier in AES participation derived from the existence of fixed costs. These costs do not vary with the amount of area enrolled such as investments needed to implement AES. An additional source of fixed costs can be transaction costs (TC). Assets are specific when they are sunk, i.e. not profitable in another transaction. Therefore actions and warrants needed to secure the transaction entail transaction costs which themselves are sunk.

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Different methodologies have been used in the literature to identify the importance of fixed costs in the adoption of voluntary environmentally friendly practices. Arguedas et al. (2008) develop a theoretical model in which two types of farmers (with low and high variable cost) face the adoption of a green technology. Their model show that in the presence of fixed costs and asymmetric information, the least-cost solution can be incentive compatible. This conclusion leads to the recommendation of allowing for a wider menu of contracts, specifying different management prescriptions and payments. Four other papers study this issue with empirical data trying to measure directly the size of fixed costs (McCann and Easter, 1999, 2000; McCann et al., 2005; Mettepinningen et al., 2009). These studies highlight the existence of fixed costs associated with participation in AES, relating these to transaction costs involved in the process of signing the contract. In addition to this, other studies have tried to identify fixed costs using accountancy data. In particular, Kuminoff and Wossink (2010) analyse the influence of uncertainty and sunk costs in the adoption of organic farming where sunk costs included the record keeping, transition, management, financial and information costs incurred during the conversion process. Results show that the organic price premium should be higher than the conventional Net Present Value as uncertainty and sunk cost are relevant. These results are confirmed using a real options model by Schatzki (2003), concluding that if future land use net returns imply irreversible investment the farmers may delay the conversion in order to gain more insight in the programme. Last, one can measure indirectly fixed costs by analysing the different variables affecting adoption and isolating the ones reflecting the existence of fixed costs (Ducos et al., 2009; Chang and Boisvert, 2009; Roberts and Lubowski, 2007). It is in this last approach that our paper is located. Different econometric specifications have been used using the mentioned approach depending on the specific problem assessed and the data availability. In particular, Roberts and Lubowski (2007) used linear regression models with interactions to assess the Fixed Costs associated of returning land to crops in the Conservation Reserve Program (CRP). Their results shows that due to the existence of fixed costs, land use changes induced by the CRP are often extended beyond contract periods. Chang and Boisvert (2009) conducted a bivariate probit model to analyse the factors affecting participation and in addition distinguishing whole-farm vs. partial-farm participation in the CRP. Factors affecting the decision the participation and not the amount of land enrolled (whole vs partial) included education, therefore reflecting less fixed transaction costs for more educated farmers. Last, in the research undertaken by Ducos et al. (2009) a generalised tobit comparing the factors affecting the decision to enroll in Agri-Environmental Schemes and the amount of area enrolled was used to assess the existence of Fixed Cost. Results show that variables reflecting transactions costs (trust in institutions, trust in the implementation of AES, previous experience in AES) have strong effect on participation with no effect on the amount of area enrolled, therefore acting as a participation barrier. However a firm conclusion cannot be made about the presence of fixed costs associated with technical aspects since a large variety of different farms and AES are represented in the sample (10 case studies spread over the EU). Our study overcomes this problem as it is based in one specific AES and therefore in the econometric analysis the specific technical characteristics of the farms were included as explanatory variables and therefore the fixed technical costs associated to the AES (involving a change in the crop pattern) can be specifically assessed. This allows us to test the existence of fixed costs without any data measuring costs or benefits which is the main contribution of our study to the literature.

For this we specify a dual framework to test and identify the sources of fixed costs by using scarce information based on direct surveys.

Table 1
Alternative crop measure (ACM) AES description.

Eligibility	• Farm with non-irrigated COP declared surface for 99-00 campaign • 25% of enrolled plots limiting forest area • Farm located in municipalities compromising Natura 2000 Sites
Requisites	• Implementing a farm management plan • Cultivate rain fed alfalfa in the non-irrigated COP declared surface maintaining the vegetable part of the plant green in summer • Harvesting and/or grazing forbidden from 31/VIII to 15/IX • For farm-holds with livestock: belonging to veterinary control group • Conventional and in favour of slope ploughing forbidden • Maximum of 10% cereal allowed in pulse crops fields
Premium	• 102 Euros/ha
Environmental benefit	• Reduce fire risk and increase nitrogen soil content

Source: BOA (2005).

In our case study, as the AES involves a change in land allocation between crops, fixed costs are also related to variable costs and benefits. Higher investment and specialisation of the farmer in a crop often implies the substitution of expending in variable costs like labour or fertilizers by an investment in better equipment and competences, inducing a higher loss when the crop is removed. Thus, in our case study it is also examined whether fixed costs associated with AES include both a transaction cost and a specific technical investment element or not. The results therefore provide evidence on whether the current approach to set premiums levels is adequate to foster adoption of this type of schemes.

Conceptual framework

In order to test whether fixed costs do limit AES adoption we assume a profit maximising farmer who faces the option to sign-up or not an AES contract. AES adoption is thus based on an increase in land profitability derived from a change in practices or land allocation. A simplified two cropping systems model is developed. "*c*" is the main cropping system and *a* is the alternative cropping system that will be subsidized by the specific AES presented in Table 1. This AES was chosen as it was hypothesized that it entails fixed costs for the farmer due to an intensive change in the farm management due to the change in the crop pattern. Both cropping systems are constraint to the non-irrigated arable land as "*a*" can only be implemented in the rain fed surface declared. The farm profit structure is defined to consider the effects of fixed costs associated either with main or alternative cropping system, as well as transaction costs associated with AES implementation. In this static model, we assume that fixed costs are sunk costs, on the other hand the costs or part of the costs of the physical assets that can be resold or rented on the market, are adjusted on a per-hectare basis and integrated into the variable profit function. So the fixed costs which are specific of each land use typically include specific knowledge costs.

Costs and benefits with and without an AES contract

Before the AES introduction, the land allocation model is based on the profit maximising Eq. (1) subject to the land constraint Eq. (2). The hypothesis assumes that farmers' are risk neutral and