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European farms' participation in agri-environmental measures

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ABSTRACT

Due to their diversity and voluntariness, agri-environmental measures (AEMs) are among the Common Agricultural Policy instruments that are most difficult to assess. We provide an EU-wide analysis of AEM adoption and farm's total AEM support over total Utilised Agricultural Area using a Heckman sample selection approach and single farm data. Our analysis covers 22 Member States over the 2000–2009 period, assesses the entire portfolio of AEMs and focuses on the relationship between AEM participation and farming system. Results show that participation in AEMs is more likely in less intensive production systems, where, however, per committed hectare AEM premiums tend to be lower. Member States group into three categories: high/low intensity farming systems with low/high AEM enrollment rates, respectively, and large high diversity countries with medium AEM enrollment rates.

1. Introduction

A core question in the debate on how to promote public goods provision by the Common Agricultural Policy (CAP) in the new programing period 2014–2020 concerned agri-environmental measures (AEMs): should we deepen cross-compliance by a small set of mandatory, uniform measures across the EU as found in the 'greening' approach or rather strengthen the current approach where a rich variety of AEMs is programed more site specific by the Member States? The compromise adopted by the Council of EU Agriculture Ministers on 16 December 2013 now foresees both compulsory new 'green direct payments' which make up 30% of national direct payments in Pillar I as well as the continuation of AEMs under Pillar II. The continuation of AEMs along with the flexibility of countries to shift funds between the two pillars once more raises the question on how these measures can be assessed both in economic and ecological terms. In this paper, we analyze European farms' participation in AEMs in order to better represent AEMs in an European-wide agricultural policy simulation model (CAPRI—Common Agricultural Policy Regionalised Impact Modelling System, e.g., Gocht et al., 2013; Renwick et al., 2013; Pelikan et al., 2014) in a later step.

AEMs provide area-based compensation payments for farmers who in turn carry out agri-environmental services that go beyond the application of usual good farming practice.[1] In practice, farmers voluntarily enter a 5-year commitment for cultivating a certain amount of area under specific agri-environmental (AE) guidelines. In fact and in spite of about 20 years of research on AEMs, their impact on agricultural production, farm incomes and environment is still difficult to assess. Due to their large diversity—they are programed at Member State or even regional level—and their character as voluntary opt-in instruments, they are difficult to assess and model across EU Member States. The number of AE programs as well as the share of agricultural land enrolled varies significantly across EU Member States (cf. Sections 2 and 4).

Therefore, AEM impact assessments are usually rather narrow, both in terms of measures and regional scope considered and in terms of width of implications analyzed. Available empirical AEM studies usually focus on specific measures in single regions or countries, providing either economically or ecologically focused assessments (Uthes and Matzdorf, 2013 provide a recent and comprehensive review of the AEM literature). Economically focused analyses are for instance provided by Bamière et al. (2011), Claassen et al. (2008), Matzdorf and Lorenz (2010), Peerlings and Polman (2008), Sattler and Nagel (2010), Uthes et al. (2010a,b), Wätzold et al. (2008), Wilson et al. (1999). Ecologically focused assessments are for example provided by Casey and Holden (2006), Critchley et al. (2004) and Feehan et al. (2005). Additionally, also sociological in-depth studies of farmers' sociological and cultural reasons for participating in AEMs are available, for example Emery and Franks (2012), Burton et al. (2008) and Falconer (2000).

In order to be able to quantify past and future economic and ecological impacts at a larger regional scale, one first needs to know

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[1] The majority of agri-environmental (AE) programs in the EU comprise measures targeting management of grass and semi-natural forage, input management, management plans and record keeping, soil cover, soil management, buffer strips, crop management and landscape feature management (Keenleyside et al., 2011).

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whether AEM participation and AEM support received across measures and countries can be attributed to certain groups of farms. This means, one needs to identify whether farmers' participation in AEMs is correlated with certain common characteristics across measures and regions and, if so, what these characteristics are. We therefore aim at analyzing farmers' AEM uptake and the total AEM support received divided by the total Utilised Agricultural Area (UAA) across measures and countries at EU-level.

Though a vast amount of general AEM literature exists (cf. Uthes and Matzdorf, 2013), the literature on farmers' uptake of AEMs in the EU is rather limited (a literature review on the adoption of conservation agriculture focusing on North and South America and Africa is provided by Knowler and Bradshaw, 2007). In the European literature, farmers' participation in AEMs has usually been analyzed by means of econometric discrete choice models.[2] In the empirical part of their paper, Vanslembrouck et al. (2002) apply a probit model to the analysis of farmers' uptake of two different AEMs (farm beautification and buffer strips) in the Belgium Flemish and Walloon regions, respectively. Their sample comprises 390 farms. Dupraz et al. (2003), again using a probit model, analyze the participation of 248 farmers in an AEM to protect the nesting of endangered birds in the Walloon region, Belgium. Defrancesco et al. (2008) distinguish between non-participation and participation in one of three specific AEMs (low-input measures and grassland conservation in two different geographical zones) in Veneto, Italy by means of a multinomial logit model. Their analysis applies to 139 farms surveyed in 2005/06. Hynes and Garvey (2009) use panel data (about 1100 farms per year in the period 1995–2005) from the Farm Accountancy Data Network (FADN) to model Irish farmers' participation in AEMs based on a logit model. Pufahl and Weiss (2009) evaluate the effects of AEMs in general (across measures) on input use and farm outputs in Germany by means of a propensity score matching. These propensity scores for participating in AEMs of 32,000 farms in the time period 2000–2005 are derived using a logit model. Giovanopoulou et al. (2011) analyze the participation and the extent of participation in terms of hectares enrolled of 125 farmers in a nitrate reduction program in Larisa, Greece using a Heckman sample selection model. Mettepenningen et al. (2013) focus on the impact of the institutional organisation of AEMs on their adoption. For this purpose they compare AEM adoption decisions of farms in an EU region (Flanders in Belgium) and Arkansas in the Unites States. They apply a logit regression to the data of 243 farms surveyed in 2008. Murphy et al. (2014) use binary logit models to identify farm characteristics affecting the duration of participation in a specific Irish scheme of agri-environmental measures and the participation in each phase of the scheme. The scheme has 4 phases and in total 4403 farms are observed over the period from 1995 to 2010.[3]

Since not only AEMs participation itself, but also the extent of participation in terms of enrolled farming area is voluntary, we follow a similar approach as Giovanopoulou et al. (2011) by applying a two-step Heckman sample selection model where in the first step the farm characteristics driving farmers' participation in AEMs and in the second step the characteristics affecting the support received per ha are identified. However, unlike Giovanopoulou et al. (2011) who had access to single farm data on the AEM support received per ha enrolled in AEMs, consistent data on the actual amount of area enrolled in AEMs is not available at EU level (neither from macro nor micro databases as discussed in Sections 2 and 4). In absence of this information, we could only use the total agri-environment payments received divided by the total area of the farm's UAA. This amount reflects two major variables, the proportion of the farm's UAA in the agri-environmental contract and the agri-environmental payment per hectare for the land under contract. The implications of this limitation are discussed at several points in the paper, particularly, in the methods, data and results section.

Following the literature and since we want to model farmers' decision on AEM uptake, we, naturally, use the most comprehensive and detailed data available.[4] The literature has largely used survey data from a number of individual farms in specific regions, some studies are based on larger scale farm-level sample data (e.g., Hynes and Garvey, 2009; Pufahl and Weiss, 2009; Murphy et al., 2014). The only harmonized microeconomic data available for such kind of analyses at European scale are FADN data, which have also been used in similar analyses by Hynes and Garvey (2009) and Murphy et al. (2014) for Ireland. FADN comprises a rotating panel of sample farms across the EU-27 on an annual basis. Specifically, our analysis is based on FADN data of 155,516 sample farms across 22 EU Member States surveyed in the time period 2000–2009. Five countries (Bulgaria, Romania, Cyprus, Greece and Lithuania) could not be considered since no or not enough counts on AE program participation were available from the database.[5] A more detailed description of the database is provided in Section 4. A general descriptive analysis of AEMs given in Section 2 is conducted based on data reported by the Member States and provided to us by the European Commission upon request (European Commission 2015; personal communication).

With respect to explanatory variables, studies based on questionnaires–naturally–put emphasis on characteristics and attitudes of the farmer herself (e.g., environmental awareness, education, age; Vanslembrouck et al., 2002; Dupraz et al., 2003, Defrancesco et al., 2008; Giovanopoulou et al., 2011, Mettepenningen et al., 2013), mostly not available for large-scale samples. Another focus in the literature is on different measures characterizing the production portfolio of farms (e.g., farm type measures, livestock densities, cropping shares; Dupraz et al., 2003; Defrancesco et al., 2008; Pufahl and Weiss, 2009; Hynes and Garvey, 2009; Giovanopoulou et al., 2011; Murphy et al., 2014). Finally, farm characteristics are often considered (e.g., farm size, share of rented land; Vanslembrouck et al., 2002; Defrancesco et al., 2008; Pufahl and Weiss, 2009; Murphy et al., 2014). Most of the studies mentioned above, especially Hynes and Garvey (2009) whose analysis is based on similar data as ours, but also descriptive studies relying on surveys on farmers' participation in AEMs repeatedly state the importance of how well the measures fit into the actual production program (e.g., Wilson and Hart, 2000; Sattler and Nagel, 2010; Keenleyside et al., 2011). This observation fits with our aim of attributing participation and support levels to certain groups of farms. We therefore focus on identifying the relationship between different production activities and AEM adoption and support received over total UAA by considering 8 different cropping shares and 4 different animal activities. Additionally, farm size, location in a less favoured area and a trend are taken into account.

The paper contributes to the literature on farms' participation in AEMs by providing the first EU-wide empirical analysis (a very

[2] We focus on quantitative assessments here since other methods are not applicable in a EU-wide context.

[3] An overview of the empirical studies on AEM adoption in the EU is given in the appendix (Table A1). The table summarises the studies described here. Due to a rapidly growing literature in this field, it does not claim to be exhaustive.

[4] Please note that the missing information mentioned above, i.e., the hectares actually enrolled in AEM programs is not available in any consistent manner at all across the EU, irrespective of the database.

[5] A similar approach based on a probit model representing the decision on considering AEM participation and a tobit model representing participation and extent of participation in terms of acreage is applied by Ma et al. (2012) for a sample of 1700 farms and some hypothetical AEMs in Michigan, USA.