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Determinants of biosecurity behaviour of British cattle and sheep farmers—A behavioural economics analysis

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ABSTRACT

The paper analyses the impact of *a priori* determinants of biosecurity behaviour of farmers in Great Britain. We use a dataset collected through a stratified telephone survey of 900 cattle and sheep farmers in Great Britain (400 in England and a further 250 in Wales and Scotland respectively) which took place between 25 March 2010 and 18 June 2010. The survey was stratified by farm type, farm size and region.

To test the influence of *a priori* determinants on biosecurity behaviour we used a behavioural economics method, structural equation modelling (SEM) with observed and latent variables. SEM is a statistical technique for testing and estimating causal relationships amongst variables, some of which may be latent using a combination of statistical data and qualitative causal assumptions.

Thirteen latent variables were identified and extracted, expressing the behaviour and the underlying determining factors. The variables were: experience, economic factors, organic certification of farm, membership in a cattle/sheep health scheme, perceived usefulness of biosecurity information sources, knowledge about biosecurity measures, perceived importance of specific biosecurity strategies, perceived effect (on farm business in the past five years) of welfare/health regulation, perceived effect of severe outbreaks of animal diseases, attitudes towards livestock biosecurity, attitudes towards animal welfare, influence on decision to apply biosecurity measures and biosecurity behaviour.

The SEM model applied on the Great Britain sample has an adequate fit according to the measures of absolute, incremental and parsimonious fit. The results suggest that farmers' perceived importance of specific biosecurity strategies, organic certification of farm, knowledge about biosecurity measures, attitudes towards animal welfare, perceived usefulness of biosecurity information sources, perceived effect on business during the past five years of severe outbreaks of animal diseases, membership in a cattle/sheep health scheme, attitudes towards livestock biosecurity, influence on decision to apply biosecurity measures, experience and economic factors are significantly influencing behaviour (overall explaining 64% of the variance in behaviour).

☆ The affiliation of some of the authors at the time the work was conducted was Scottish Agricultural College (SAC). On the 1st October 2012 SAC merged with Barony, Elmwood and Oatridge Colleges and is now known as SRUC.

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Three other models were run for the individual regions (England, Scotland and Wales). A smaller number of variables were included in each model to account for the smaller sample sizes. Results show lower but still high levels of variance explained for the individual models (about 40% for each country). The individual models' results are consistent with those of the total sample model. The results might suggest that ways to achieve behavioural change could include ensuring increased access of farmers to biosecurity information and advice sources.

1. Introduction

Despite strong evidence of considerable public and private net benefits from investment in biosecurity at farm level, uptake and implementation on UK cattle and sheep farms remains poor. Previous work has shown such farmers to be generally dismissive of biosecurity actions and focused more on attribution for the disease threats themselves. This has serious implications for policy. Understanding which determinants influence farmers' behaviour would assist policy makers to achieve behavioural change.

Biosecurity is an integral part, as well as legal requirement, of livestock production. There is a large number of biosecurity and animal health measures that can be taken along the supply chain from producers to processors, however farmers are the ones who are generally considered to be the first line of defence in disease mitigation (Burrell, 2002; Palmer et al., 2009). Farmers are provided with information, advice and regulations to learn and follow, however not all of them have the same attitudes and/or behaviour towards biosecurity due to heterogeneous factors which affect their decision-making (Fairweather and Keating, 1994; Gasson, 1973; Maybery et al., 2005; Gunn et al., 2008; Heffernan et al., 2008). These factors do not necessarily relate to business/profit aspects (Brodt et al., 2006; Garforth and Rehman, 2005; Gasson, 1973; Gasson and Errington, 1993; Maybery et al., 2005; Gunn et al., 2008; Heffernan et al., 2008).

The literature on farmer behaviour and decision-making has shown that there is a number of factors that potentially influence the decision-making process and hence farmer's behaviour, such as farm's physical and economic constraints, farmer's socio-demographics and their access to the information available, which will influence their understanding of the issues and the consequences of implementing or not biosecurity measures.

The physical attributes of the farm will largely determine what biosecurity measures are required and the level of investment (be it financial or labour) needed. Farmers perceive the level of investment required to implement many biosecurity measures to be costly. Either requiring an increase in management effort with a higher demand on labour and time (Dwyer et al., 2007; Gunn et al., 2008; Hubbard et al., 2007; Morgan-Davies et al., 2006) or requiring changes to the system, such as building improvements or maintenance of boundaries (Bewsell and Monaghan, 2007; Brennan et al., 2008). As well as the farm's physical constraints, the financial situation of the enterprise will impact on what measures the enterprise can afford to implement (Chilonda and Van Huylenbroeck, 2001; Stott et al., 2003; Tuyttens et al., 2007).

Farmer's socio-demographics characteristics and attitudes towards animal health/biosecurity measures also have a key role in the decision-making process. Age, education, experience, cognitive ability, household status, lifestyle attitude, goals and values of a farmer have all been shown to affect the decisions being made and the resultant behaviour seen (Blackstock et al., 2010; Fairweather and Keating, 1994; Gasson, 1973; Ostrom, 2003; Small et al., 2005; Zijp, 1998). Numerous studies have shown that farmers at different life stages make different management decisions. For example younger farmers with large herds and few dependents are more likely to engage with an eradication programme. Whereas, older farmers with no successors are less likely to implement changes in their management systems (BVA, 2005; Tuyttens et al., 2007). Education, experience and cognitive abilities are all variables which have a significant impact on the decision making process and are often linked to the age of the decision-maker. Moreover, education and training have been shown to enhance and influence farmers' willingness to implement a change in management practices (Austin et al., 2001; Gasson, 1998; Kilpatrick, 1996). However, it is the farmers' ability to understand the problems, risks and potential effects that will influence the farmers' behaviour and attitudes to animal health and biosecurity (Chilonda and Van Huylenbroeck, 2001; Mariner and Paskin, 2000; Palmer, 2006).

The ability of the farmer to assimilate and understand information on biosecurity issues affects the perceived risk of a disease outbreak. For example, diseases which have not been present in a system for a prolonged time may be considered low risk thereby a farmer is more likely to behave in a 'risky' manner (Ekboir, 1999). Conversely, in an outbreak situation the perceived and actual risks are elevated and the likelihood of implementing biosecurity measures is greatly increased (Coleman et al., 1998; Delabbio, 2004; Ekboir, 1999; Lindberg et al., 2006).

A key factor influencing farmer behaviour is the access to available sources of information on biosecurity measures and animal health issues (Bingham et al., 2008; Heffernan et al., 2008; Olmstead and Rhode, 2007; Palmer et al., 2009). Findings from the literature suggest that farmers are more likely to act on the information provided by trusted advisors such as vets or by someone with whom they have built up a trusting relationship (Blackstock et al., 2010; Lindberg et al., 2006; Marshall et al., 2006; Mills et al., 2006). Farmers often perceive particular regulations to be confusing as well as, in some cases, inappropriate to the needs of their farm system. This might have a negative effect on the uptake of biosecurity measures if farmers are unable to interpret messages applicable to their enterprise