DETERMINANTS OF FARMERS' UPTAKE OF ANIMAL HEALTH AND WELFARE TECHNOLOGIES UNDER THE COMMON AGRICULTURAL POLICY

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Abstract

This study analyses the impact of *a priori* identified determinants of adoption of innovative animal health and welfare technologies by Scottish livestock farmers. The analysis uses a dataset of 1,764 observations for livestock farmers collected through a large scale survey of Scottish agricultural holdings, and structural equation modelling to test influences on technology adoption intentions and behaviour. Having made changes to business; perceived effects of technology and information on business; being recipient of a single farm payment; age; economic characteristics; access to/perceived usefulness of information; and perceived difficulty to change have significant influence on both technology adoption behaviour and intentions.

Keywords: technological uptake, animal health and welfare innovations, behaviour and intentions, structural equation modelling.

1. Introduction

There is an ever growing literature analysing technology adoption behaviour in agriculture. Part of this literature focusses on the factors that influence decision making as regards adoption of technology (Fairweather & Keating, 1994; Beedell & Rehman, 2000; Nuthall, 2001; Flett et al., 2004; Rehman et al., 2007).

This study builds on existing literature and analyses the impact of *a priori* identified determinants of adoption of innovative animal health and welfare technologies by Scottish livestock farmers.

2. Method and data

The data used in this study were collected through a large scale survey of Scottish agricultural holdings, which was completed in September 2013, and investigated farmers' behaviour and intentions under the current and next CAP reform. The dataset analysed in this study comprises 1,764 observations for livestock farmers.

We used structural equation modelling (SEM) with observed and latent variables to test the impact of factors on technology adoption intentions and behaviour, and assess the strength of these relationships, i.e. how much these factors influence one another and primarily the behaviour and intentions. The model consists of two parts, namely the measurement model, which specifies the relationships between the latent variables and their constituent indicators, and the structural model, which designates the causal relationships

between the latent variables. We perform model estimation with the Diagonally Weighted Least Squares (DWLS) method using the statistical package Lisrel 8.80 (Jöreskog and Sörbom, 2007). DWLS estimation method is consistent with the types of variables included in the model (i.e., ordinal and categorical) and the deviation from normality in some of these variables (Finney and DiStefano, 2006).

The variables included in the model are:

- socio-economic characteristics (age, education, income);
- perceived effects on business (from changes in technology, access to advice/information on new opportunities and changes in animal welfare regulations and policies) under the past and current CAP reforms;
- changes to business (intensity of production, number of livestock, amount of family labour, level of animal welfare, amount invested in new technologies) under the past and current CAP reforms;
- intentions to make changes to business (intensity of production, number of livestock, level of employed labour, level of animal welfare, amount invested in new technologies) under the next CAP reform;
- perceived difficulty to change (size of business, intensity of production, number of livestock, amount invested in new technologies, level of animal welfare);
- being recipient of a Single Farm Payment (SFP);
- perceived usefulness of information sources (open days, monitor/ demonstration activities, other farmers, media, agricultural consultants, government information sources, representatives of research/educational organisations, industry organisations);
- frequency of access to novel technology information (new genomic technologies, farm management systems that use individual animal electronic ID (EID), cattle surveillance through British Cattle Movement Service, qualitative behaviour assessment (QBA), anaerobic digestion, pedometers or activity monitors to detect oestrus and increase fertility/conception);
- animal health and welfare technology adoption behaviour (new genomic technologies, farm management systems that use individual animal electronic ID (EID), cattle surveillance through British Cattle Movement Service, qualitative behaviour assessment (QBA), anaerobic digestion, pedometers or activity monitors to detect oestrus and increase fertility/conception, webcams/ smartphones/ tablets for animal husbandry) under the past and current CAP reforms;
- intentions to adopt animal health and welfare technologies (new genomic technologies, farm management systems that use individual animal electronic ID (EID), cattle surveillance through British Cattle Movement Service, qualitative behaviour assessment (QBA), anaerobic digestion, pedometers or activity monitors to detect oestrus and increase fertility/conception, webcams/ smartphones/ tablets for animal husbandry) under the next CAP reform.

3. Results

The conceptual path diagram is presented in Figure 1.

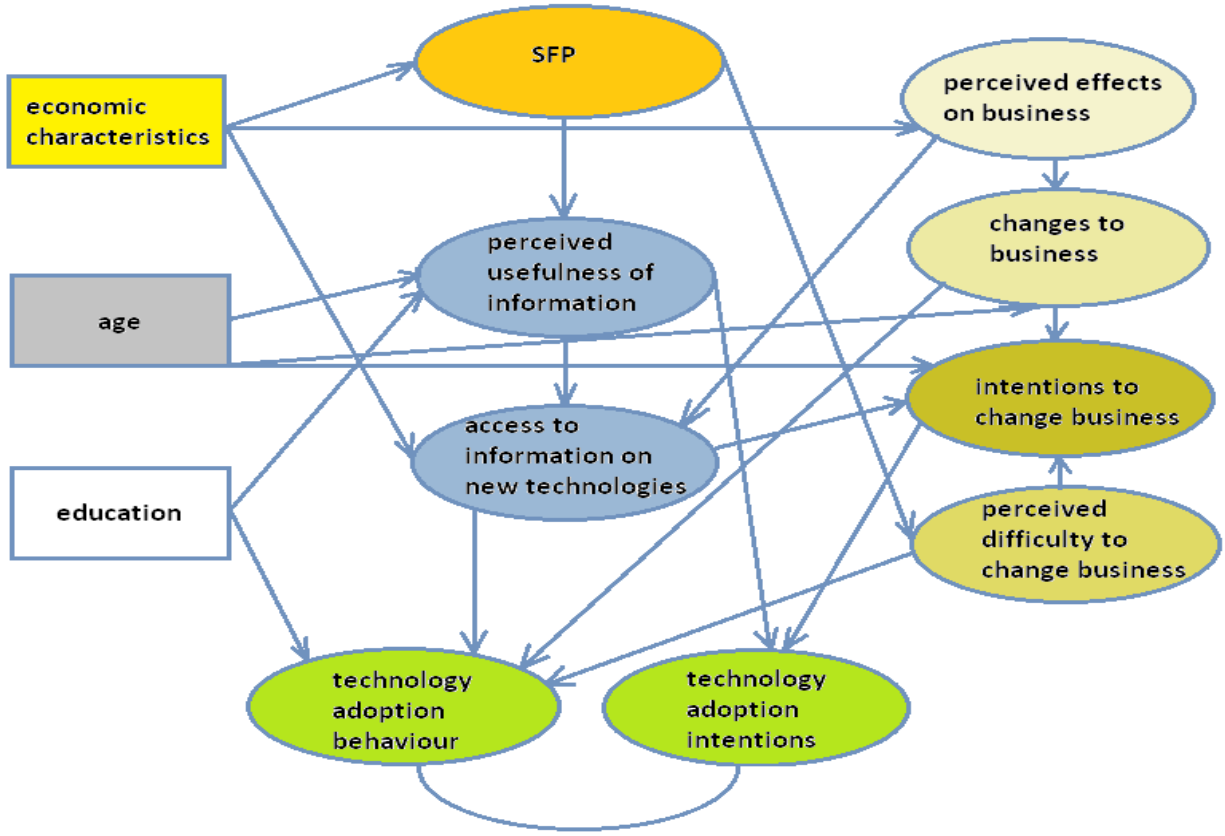

Figure 1. Conceptual path diagram

The model has a good fit according to the measures of absolute, incremental and parsimonious fit (Hair et al., 2006). The model explains 72 per cent of the variance in current adoption behaviour and 54 per cent of the variance in intentions to adopt new technologies (Table 1). Having made changes to business under the past and current CAP reforms; effects of technology and information on business under the past and current CAP reforms; economic characteristics; perceived usefulness of info sources; being recipient of a single farm payment; access to information on new technologies; age; perceived difficulty to change have significant influence on both technology adoption behaviour and intentions. Current adoption behaviour is also influenced by farmer education, while intentions to adopt technologies in the future are also influenced by intentions to make changes to business under the next CAP reform. The results suggest that the CAP reforms, through both the single farm payment and the fostering of knowledge transfer and innovation have influenced and will continue to influence farmers' decision making.

Table 1. Standardised total effects (t-values in parentheses)

Standardised total effects (t-values in parentheses)	Total effects on								
	effects on business	changes to business	intentions to change	difficulty to change	SFP	info sources usefulness	technology information frequency of access	technology adoption behaviour	technology adoption intentions
age	-0. 08 (-5.43)	-0. 22 (-5.80)	-0.35 (-7.76)	-	-	-0.19 (-5.61)	-0.07 (-5.36)	-0.17 (-6.30)	-0.26 (-8.86)
education	-	-	-	0.03 (3.22)	-0.07 (-3.17)	0.08 (2.73)	0.01 (0.10)	0.09 (2.38)	0.01 (0.60)
economic characteristics	0.51 (10.88)	0.30 (9.58)	0.32 (11.58)	0.29 (7.85)	0.61 (8.99)	0.34 (9.26)	0.39 (11.67)	0.36 (10.64)	0.26 (11.35)
effects on business	-	0.59 (13.79)	0.42 (13.85)	-	-	-	0.16 (3.62)	0.45 (9.35)	0.27 (6.79)
changes to business	-	-	0.67 (16.54)	-	-	-	-	0.68 (10.92)	0.44 (7.17)
intentions to change	-	-	-	-	-	-	-	-	0.65 (9.40)
difficulty to change	-	-	0.19 (5.53)	-	-	-	-	0.13 (4.48)	0.13 (5.87)
single farm payment	0.24 (12.32)	0.14 (9.57)	0.22 (9.80)	0.48 (7.50)	-	0.56 (12.17)	0.19 (10.91)	0.22 (9.77)	0.23 (10.02)
info sources usefulness	0.43 (15.40)	0.25 (11.59)	0.22 (13.36)	-	-	-	0.35 (14.70)	0.27 (11.83)	0.31 (7.66)
technology information - frequency of access	-	-	0.16 (4.82)	-	-	-	-	0.30 (8.05)	0.10 (4.39)
R-square	0.42	0.39	0.70	0.23	0.38	0.36	0.27	0.72	0.54

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