Non-farmers' willingness to farm: a large-scale choice experiment to identify policy options that can induce new entry to the agricultural industry

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Abstract

With the farming population aging across the developed world, securing a new generation of agricultural producers is an important step towards overcoming global food problems. The vast majority of the existing literature on new entry to agriculture base their analysis on data obtained from existing farms and farmers, an approach not necessarily adequate because the people who actually make decisions about entry are non-farmers. In this paper, we report the results of a large-scale choice experiment conducted in Japan to investigate the willingness of the country's non-farming population to enter the agricultural industry. The results of a random parameter logit estimation showed that, in the absence of farmland, technical support and guaranteed sales, the agricultural income required to induce entry of an average Japanese person is approximately ¥22.0M (£121,000), a level well above their present income of ¥5.4M (£29,700); however, when all three services are provided, this value drastically lowers to ¥4.6M (£25,300). In addition, a ¥1M (£5,500) increase in agricultural income raises a person's likelihood to enter the industry by 1.6 percentage points. To the best of the authors' knowledge, this is the first study to quantitatively investigate non-farmers' willingness to enter the agricultural industry.

Keywords Choice experiment, new entry, random parameter model, structural change
JEL codes J43, Q13, Q18

1. Introduction

With the farming population aging across the majority of the developed world, securing a new generation of agricultural producers is an important step towards overcoming global food problems. The European Commission and the US Department of Agriculture both publicly recognise the existence of the so-called young farmer problem, under which the entry rate and the retirement rate are simultaneously low, and thus the age structure of the industry is not dynamically stationary (Gale 2003; Davis et al., 2013).

While intra-family succession is the most common form of new entry into agriculture, outmigration of young generations to urban areas, together with an increasing number of smallholding farmers who do not wish their children to succeed their operations, also necessitates the recruitment of new entrants from outside the industry (Carbone and Subioli, 2011). Such movement of people has additional benefits to rural communities, according to recent research, as various skills they bring into the industry have a tendency to improve the agricultural productivity in the region (Ingram and Kirwan, 2011). At the same time, however, few policy instruments have been found to stimulate employment in agriculture (Petrick and Zier, 2012).

In order to explore effective policy options to induce independent new entrants to the agricultural industry, an ex-ante assessment for each of the proposed policy interventions is necessary. Yet, despite this requirement, the vast majority of the existing literature examining the issue of new entry and future industrial structure base their analysis on data obtained from existing farms and farmers (Perloff, 1991; Foltz,

2004; Zimmermann et al., 2009; Chopin et al., 2015). As an ex ante assessment, this approach is not always adequate because the people who make decisions about entry to agriculture are, of course, non-farmers.

In this paper, we report the results of a large-scale choice experiment conducted in Japan to investigate the willingness of the country's non-farming population to enter the agricultural industry. As with many parts of Europe and the United States, Japan suffers from a steady loss of young farmers, with 58% of full-time farms being without a labour force under 65 years of age (Martini and Kimura, 2009). In 2012, the Japanese government introduced a new subsidy system loosely modelled after the French version of the New Entrant Scheme, whereby a fixed income is guaranteed for young new entrants while they undertake a two-year training program at the beginning of the new career (Uchiyama, 2014).

Using this program as a baseline scenario, our experiment tried to elucidate how farming was being perceived by the non-farming population most of whom lived in urban areas and what the government could do to effectively induce new entry, preferably of skilled and motivated people, to replace aging incumbents. While a small number of choice experiments have previously been conducted in the area of labour economics (Lagarde and Blaauw, 2009; Jin et al., 2011), to the best of the authors' knowledge, this is the first study to quantitatively investigate non-farmers' willingness to enter the agricultural industry.

2. Data and estimation methods

The experiment was conducted with 3,000 non-farming adults residing in Japan aged between 20 and 59. At the time of sampling, the sample's age, gender and geographical distributions were calibrated so that it makes a good representation of the country's adult population. The average household income of the sample was ¥ 6.1M (£ 33,550), slightly higher than the national average of ¥ 5.4M (£ 29,700), due to the exclusion of pensioners from the sample.

Each participant was presented with 12 choice sets, which collectively satisfied the orthogonal structure. Each choice set comprised a random combination of four attributes, namely the income earned after entry to agriculture (¥2M/6M/10M, or £11,000/33,000/55,000), whether the agricultural land is readily available or needs to be arranged by the entrant themselves (binary), whether or not a round-the-clock technical support system is provided even after the conclusion of the initial training program (binary), and whether the sales of the products is guaranteed or the marketing channels have to be established by the entrant themselves (binary). The last three attributes are factors identified as major entry barriers to agriculture by preceding studies (Zagata and Sutherland, 2015). In addition to two randomly drawn choices, the outside option representing non-entry to agriculture (and thus maintaining the present income) was always provided.

Furthermore, participants were randomly divided into three groups of 1,000 and given different hypothetical conditions regarding how and under what condition they were going to undertake the two-year training program to learn the trade: every weekend

while keeping the current job, fulltime with the payment of ¥1.5M (£8,300) per annum, or fulltime with the payment equivalent to the current income from the non-farming job. The second condition corresponds to the present subsidy system whereas the other two are hypothetical.

The data were then analysed by the multinomial logit model and random parameters logit model, both of which are based on the random utility theory (Revelt and Train, 1998). Constraining the outside option to have a zero indirect utility, the indirect utility for the other two choices (i.e. entry to agriculture) was specified as follows:

$$U = \beta_0 + \beta_1\, income + \beta_2\, land + \beta_3\, technical + \beta_4\, sales + \beta_5\, trainingb + \beta_6\, trainingc + \varepsilon \quad (1)$$

where variables *income*, *land*, *technical*, and *sales* jointly constitute the four attributes of the choice sets discussed above, whereas *trainingb* and *trainingc* are dummy variables for different conditions associated with pre-entry training presented to participants. Throughout the analysis, parameters β_0, β_1, β_5 and β_6 were assumed to be constant, while β_2, β_3 and β_4 were assumed to be heterogeneous across individuals (or more accurately across choices) and normally distributed for the random parameters specification. The error term ε was assumed to follow the Type I generalised extreme value distribution. In order to obtain an accurate insight regard the *population*-level willingness to enter the industry, we opted not to include sociodemographic variables in Equation (1). While this approach is justifiable only when the sample size is large and the sample distribution is similar to that of the population, the present sample meets these prerequisites.

3. Results and discussion

The results of the estimations of Equation (1) are summarised in Table 1. While the violation of the independence of irrelevant alternatives (IIA) assumption was suspected and thus the random parameters model would likely have produced less biased estimators, on the practical level the two models both yielded comparable estimators for the mean values. Existence of the heterogeneity across individuals was suggested for the level of utility provided by the arranged farmland and post-entry technical support, but not for marketing assistance. The overall model-fit was reasonable and all of the four attributes presented to the participants had statistically significant effects (of the expected directions) on their indirect utilities. These findings were robust to the type of the training program assigned to participants, as suggested by statistically insignificant estimators for the training variables and the results of subsample estimations conducted for each group of 1,000 participants (not shown).

From the derived indirect utility function, it follows that in the absence of farmland, technical support and guaranteed sales, the agricultural income required to induce entry of an average Japanese person is approximately ¥22.0M (£121,000), a level well above their present income of ¥5.4M. However, when all three of the abovementioned services are provided, this value radically lowers to ¥4.6M (£25,300). This change is attributable to their willingness to pay to receive these services, at the cost of ¥4.9M (£26,950, farmland), ¥6.1M (£33,550, technical support) and ¥6.4M (£35,200, guaranteed sales), respectively. In addition, a ¥1M (£5,500) increase in agricultural income raises a person's likelihood to enter the industry by 1.6 percentage points, based on the estimation by probability weighted sampling enumeration.

Our post-estimation simulation analysis indicated that, when the prospective income is fixed at ¥6M, the expected entry rate is 20.9% with no support, and 70.4% with full support (Table 2). While these figures are conditional on the government expenditures required to run training programs and compensate for the lost income during the two-year period, it is a striking result to show urban people's interest in agriculture and possibly associated lifestyle—as long as their income is guaranteed and risk is managed. Most importantly, their willingness to enter the farming industry has been found to be considerably, and almost equally, affected by the availability of land, post-training technical support and guaranteed marketing channel. Thus, to induce new entry, the country needs to either invest in these services or, as a likely lower cost option, establish a method to screen potential entrants who are already equipped with skills that could minimise requirements for these services.

4. Conclusion

As mentioned earlier, we believe this is the first study to quantitatively investigate non-farmers' willingness to enter the agricultural industry. The methodology and results of this paper are also relevant to the majority of EU member countries, whose demographic conditions are generally similar to what are observed in Japan.

Given that potential new entrants are non-farmers, an analysis of this issue through revealed preference methods would be nearly impossible and thus, in our view, the use of the stated preference approaches is justified. While we are acutely aware of the

existence of the hypothetical bias suffered by choice experiments (Harrison and Rutström, 2008), and this bias might be even larger for experiments dealing with life-changing choices such as career selection. However, we take the position that this bias is the lesser of two evils when compared to the selection bias caused by not investigating the preferences of non-farmers at all. That said, our future research will focus on the development of methodologies to minimise the hypothetical bias, possibly by organising real training programs through which the participants can feel 'more real' about their potential farming life. Unfortunately, this would have to come with a significantly reduced sample size, under which the population-level inference would become less reliable.

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Table 1. Estimation results

	Multinomial logit	Random parameters logit
Point estimators		
Intercept	– 2.77**	– 2.82**
	(0.03)	(0.03)
Prospective income (¥1M)	0.12**	0.13**
	(0.002)	(0.003)
Land availability	0.61**	0.63**
	(0.17)	(0.19)
Technical support	0.77**	0.76**
	(0.17)	(0.18)
Guaranteed sales	0.80**	0.82**
	(0.17)	(0.18)
Training type (fulltime, ¥1.5M)	0.27	0.27
	(0.25)	(0.26)
Training type (fulltime, current income guaranteed)	– 0.46	– 0.47
	(0.25)	(0.26)
Standard deviation estimators		
Land availability		0.19*
		(0.08)
Technical support		0.35**
		(0.07)
Guaranteed sales		0.02
		(0.06)
Observations	36000	36000
Pseudo R-squared	0.0971	0.1453
Log likelihood	– 33,813	– 33,799

Numbers in parentheses are the standard errors of the estimators.

** significant at 99%, * significant at 95%.

Table 2. Predicted entry rate to the agricultural industry

Prospective income	With full support	With no support
¥2M (£11,000)	59.0%	13.8%
¥6M (£33,000)	70.4%	20.9%
¥10M (£55,000)	79.7%	30.4%

Values are based on the estimators obtained by multinomial logit estimation. Values based on random parameters logit estimation are almost identical to those above because of the close proximity between the two sets of estimators (Table 1).