Working Papers SMART - LERECO

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Douadia BOUGHERARA, Gilles GROLLEAU, Naoufel MZOUGHI

Working Paper SMART – LERECO N°09-03

January 2009

UMR INRA-Agrocampus Ouest **SMART** (Structures et Marchés Agricoles, Ressources et Territoires)

UR INRA **LERECO** (Laboratoires d'Etudes et de Recherches Economiques)

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Douadia BOUGHERARA

INRA, UMR1302 SMART, F-35000 Rennes, France
Agrocampus Ouest, UMR1302 SMART, F-35000 Rennes, France

Gilles GROLLEAU

ENSAM, UMR1135 Laboratoire Montpelliérain d'Economie Théorique et Appliquée, F-34000 Montpellier, France

Naoufel MZOUGHI

INRA, UR 767 Ecodéveloppement, F-84000 Avignon, France

Auteur pour la correspondance / Corresponding author

Douadia BOUGHERARA
INRA, UMR SMART
4 allée Adolphe Bobierre, CS 61103
35011 Rennes cedex, France
Email: Douadia.Bougherara@rennes.inra.fr
Téléphone / Phone: +33 (0)2 23 48 56 03
Fax: +33 (0)2 23 48 53 80

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Abstract

This paper examines which factors determine the participation of households in long term contracting with local farmers. Are households motivated by reducing the environmental impacts of their food consumption? A discrete-choice model of community supported agriculture (CSA) participation is applied to a sample of 264 French households. The findings suggest that difficult-to-measure attributes, notably environmental considerations play a major role in explaining CSA participation.

Keywords: community supported agriculture; food supply; transaction cost economics

JEL Classification: D13, D23, Q13

Analyse des déterminants de la participation à une AMAP

Résumé

Nous analysons les déterminants de la participation des ménages dans des contrats de long terme avec les producteurs locaux, notamment quelle est la part des motivations environnementales dans les choix alimentaires. Un modèle de choix discret de participation à une AMAP (Association pour le Maintien d'une Agriculture Paysanne) est appliqué à 264 ménages français. Les résultats indiquent que les attributs difficilement mesurables tels que les attributs environnementaux jouent un rôle majeur dans la décision de participer à une AMAP.

Mots-clefs : AMAP, coûts de transaction

Classification JEL : D13, D23, Q13

Buy local, pollute less: What drives households to join a community supported farm?

1. Introduction

In several developed countries, most households have secure quantities of food with verifiable attributes, so they increasingly focus on less tangible dimensions such as food safety and health (*e.g.,* absence of pesticide residue), environmental conditions, geographic and social affinity (*e.g.,* locally grown products, support of 'small' producers, fair trade considerations) and animal welfare. Accordingly, economists have drawn a useful distinction between search, experience, and credence attributes according to the ability of the buyer to assess the promised quality. Search attributes refer to visual aspects of the product (for example, its color). Experience attributes refer to non visual but easily assessed attributes, *i.e.*, after the consumption (the taste, for example). Finally, credence attributes are those that cannot be assessed even after consumption, such as an environmentally-friendly process. It is then obvious that information asymmetry is more problematic when dealing with credence attributes. This distinction has been successfully applied to the analysis of food quality, especially safety dimensions (Caswell and Modjuszka, 1996; Caswell and Grolleau, 2007).[1] Without negating the importance of search and experience attributes in judging food quality, the ratio of salient credence attributes over salient search and experience attributes is increasing over time. Given that credence attributes are inherently 'difficult to measure' at the consumption stage (especially if they include very specific dimensions) they are crucial parameters in terms of information asymmetry and influence the household's overall judgment over food quality (Caswell and Grolleau, 2007).

At the same time, several developed countries have experienced increases in local food supply, for example through community supported agriculture (CSA), where a farmer under contract with a small group of households delivers foodstuffs. In 2004, there were 1,700 CSAs in the U.S., between 500 and 1,000 in Japan, 90 in England, 60 in Quebec, and 50 in France.[2] The purpose of this paper is to determine what drives households to join a

[1] See also Victorian Department of Primary Industries, 2004, Beyond Price and Quality: Understanding Credence Attributes of Food Products in Victoria's Priority Markets, Melbourne, Australia.

[2] http://alliancepec.free.fr/Webamap/index.php (accessed February, 9, 2007). These estimates can occult the growing importance of CSA. For example, several millions of Japanese households participate in CSA or Teikei systems, which account for a major share of fresh produce consumption. According to Local Harvest

community supported farm. Are participating households motivated by environmental considerations? Environmental benefits due to an environmentally friendly production process[3] and reduced 'food miles' (thanks to the proximity between production and consumption) are intuitively appealing and frequently used to legitimate locally grown products[4] despite some debates over the scientific validity of these claims (Smith *et al*., 2005; Blanke and Burdick, 2005; Stagl, 2002).[5] Interestingly, the *Teikei* system in Japan, widely considered the first CSA arrangement, was developed 'by a small group of Japanese women concerned with food safety, pesticide use, processed and imported foods'. Labeling frauds for organic foods is also said to have stimulated increase in direct market relationships (Miles and Brown, 2005). New arrangements such as CSA can redefine to some extent the relationships between farmers and society.

Our theoretical framework builds on transaction cost economics, hereafter TCE (Williamson, 1985; 1991; 2005; Barzel, 1982; 2005) which seeks to explain why all transactions are not achieved through standard markets. Some transactions take place in the context of a hierarchy (integration between seller and buyer). Assuming the existence of positive transaction costs, TCE contends that profit maximizing entities will minimize overall costs by selecting the most efficient governance structure. Most of the explanatory power of the theory comes from the transaction dimensions –asset specificity (Williamson, 1985; 1991; 2005) or/and measurement issues (Barzel, 1982; 2004; 2005)– that determine which governance structure

(http://www.localharvest.org/), 'the number of North American CSA farms has grown to about 2,000 to 2,500' and 'growth has really picked up since 2000 with about 120 starting each year' (Batz, B.J., 2007, Community Supported Agriculture brings the farm to your front door, *Pittsburgh Post-Gazette*, March, 1st, http://www.post-gazette.com/pg/07060/765794-34.stm, accessed March, 6, 2007).

For anecdotal evidence on the growth of CSA arrangements in some major cities of United States, see also Saulny S., Cutting Out the Middlemen, Shoppers Buy Slices of Farms, The New York Times, July 10, 2008, http://www.nytimes.com/2008/07/10/us/10farms.html?pagewanted=print.

[3] The production process is frequently tailored to fit the precise demands of the consumer group.

[4] 'most [shareholders] agreed that the urge to buy and spend locally — to avoid the costs and environmental degradation that come with shipping and storage — was behind the decision to join' (Saulny S., Cutting Out the Middlemen, Shoppers Buy Slices of Farms, The New York Times, July 10, 2008, http://www.nytimes.com/2008/07/10/us/10farms.html?pagewanted=print.).

[5] The non-academic press has recently echoed these counter-arguments in an article titled 'Good food? Why ethical shopping harms the world?', *The Economist*, December, 9-15th, 2006, 9, 71-73.

will minimize the level of transaction costs in various circumstances. Transactions with various levels of 'difficulty of measurement' are aligned with governance structures so as to effect a discriminating alignment that minimizes the sum of production and transaction costs. Accordingly, we conducted a survey to determine whether the measurement difficulty related to environmental and social attributes explains the commitment of households in long term contracts with farmers.

The remainder of this paper is organized as follows. Section 2 characterizes CSA arrangements along with two other supply modes used by households to buy their agricultural products, that is, traditional 'spot' markets and home production. Section 3 reviews the literature devoted to the motives behind CSA commitments and presents the TCE conceptual framework. The main proposition drawn from the conceptual framework is tested empirically in section 4. Results are also discussed and some policy implications are stressed. Section 5 concludes.

2. Characterization of CSA arrangements along with traditional 'spot' markets and home production

While some consumers rely on traditional retailers to get agricultural products, others contract directly with local farmers, *e.g.*, CSA arrangements, or produce their food themselves. These different ways of supply are not mutually exclusive and generate different environmental outcomes. In developed countries, the grocery stores have the highest 'market share' among these three modes of supply. Let us briefly characterize the two polar supply channels, *i.e.*, spot market and home production, and then focus on CSA arrangements (Table 1).

Table 1: Summary of distinctive criteria between the three 'archetypes' for food supply (Source: The authors)

Criteria	Traditional markets	CSAs	Household production[6]
Degree of product standardization	+++	+	-
Strategies to overcome information asymmetry	Third-party certification Brand name	Face-to-face approach Formal possibility of inspecting farms	Integration
Level of personalization	-	++	+++
Who incurs the risk (*e.g.*, reduced yields due to climatic or pest factors)?	The farmer	The farmer and the consumer	The consumer
Contract duration (or duration of commitment between partners)	-	++	+++
Price fluctuation	+++	+	-

-, +, ++ and +++ refer to 'very weak or absent', 'weak', 'high', and 'very high', respectively.

In traditional retailing, the products are standardized. The transacting parties are frequently anonymous without dependency relationship between them.[7] To convince households about credence attributes, retailers frequently use various devices such as brand names, third party certificates or labeling[8] (Caswell and Modjuszka, 1996; Caswell and Grolleau, 2007). Households can also produce themselves the agricultural food they consume, generally in small familial gardens. In France, home production as a share of total food expenditures was declining and estimated at about 10 % in the nineties (Caillavet *et al.*, 1998).

[6] Household production, when it is a hobby, is very different from traditional markets and CSAs. The household production addressed here is driven by efficiency considerations (minimization of overall costs) rather than by hobby considerations.

[7] This characterization is, to some extent, oversimplified. Customers are dependent on the existence of large stores for their food. On the other side, stores are dependent upon their regions for labor and operating permits. People from the community work in the large stores, so there is familiarity between them, especially when they work in the same store for many years.

[8] An interesting example of third party certificate guaranteeing pesticide residue free product is the NutriClean® certification program (http://www.scscertified.com/foodag/nutriclean/).

In contracting with local farmers, things are different. Contract duration goes from 6 months to one year. CSA 'consists of individuals who pledge support to a farm operation so that the farmland becomes, either legally or spiritually, the community's farm (…). By direct sales to community members, who have provided the farmer with working capital in advance, growers receive better prices for their crops, gain some financial security, and are relieved of much of the burden of marketing'.[9] It should be noticed that prices received by farmers can be better notably because there are less intermediaries and households can work freely at the farm[10] (Cooley and Lass, 2005; Stagl, 2002). Consequently, costs are reduced and the added value is quasi directly recuperated by the farmer, even if the prices of conventional products and CSA products are similar. Nevertheless, this perceived price cannot include from the consumer viewpoint the transport cost and the adaptation costs, for example due to the lack of variety and guarantee on quantities delivered. The price issue raises the question of whether the value of more easily measured attributes is so much greater than the less-easily measured attributes that the less-easily measured ones do not really influence the ultimate choices of consumers. Nevertheless, empirical evidence about prices of CSA products in comparison of other channels is too fragmentary to draw a reliable conclusion.

It is often argued that buying a product from a CSA allows the buyer to put a face back on a person's food.[11] According to O'Hara and Stagl (2001, p. 546), 'multiple dimensions of interaction and communication are relevant to establishing the trust lost in disembodied markets. And while personal interaction may not be a guarantee for trust, it may fill the vacuum created by the erosion of 'faceless commitments' in illusive global markets as 'facework commitments' are re-established'. Formally, in CSA arrangements, the consumer

[9] DeMuth, S., 1993, Defining Community Supported Agriculture, An Excerpt from Community Supported Agriculture (CSA): An Annotated Bibliography and Resource Guide, USDA, National Agricultural Library, Alternative Farming Systems Information Center (available at: http://www.nal.usda.gov/afsic/csa/csadef.htm).

[10] 'Shareholders are not required to work the fields, but they can if they want, and many do' (Saulny S., Cutting Out the Middlemen, Shoppers Buy Slices of Farms, The New York Times, July 10, 2008, http://www.nytimes.com/2008/07/10/us/10farms.html?pagewanted=print.).

[11] It is precisely the meaning of the word *'Teikei'* in Japanese, corresponding to CSA in the U.S. Nevertheless, the face-to-face trust approach to claim verification does not necessarily require a 6-month commitment and can be considered, and as a part of the product with its own status value, as well as part of the contractual arrangement (see Severson, 2008). Lastly, the face-to-face trust approach may not be working in the sense that CSAs may not be living up to the claims that consumers must accept based on face-to-face trust (or the possibility of face-to-face interactions) with farmers.

group participates in the decision of what is produced and how it is produced. This definition can include specific environmental requirements. Reality is frequently different because people do not actively participate in the production decisions. Nevertheless, consumers may enjoy the formal possibility of doing so.

Moreover, local foods are frequently presented and marketed, sometimes unduly, as a response to environmental concerns regarding the growing distances that (imported) foods consumed within developed countries travel (Pretty *et al*., 2005; Smith *et al*., 2005; Stagl, 2002). When an unobservable attribute is proposed in traditional markets, a third party intervenes to certify the promised quality (*i.e.*, institutional trust) whereas the CSA arrangement lies on interpersonal relationships and mutual trust. Contrary to traditional retailing, under CSA arrangements, the risks are shared by the two sides (Lamine, 2005). If the outcome is less (respectively more) than expected, for example due to bad climatic conditions, there is no refund for the participants (respectively a sharing among participants). In CSA arrangements, prices are frequently negotiated making agents 'price makers'.[12] Sometimes, real-world arrangements differ from textbook arrangements in several respects. For example, in France, some farmers engaged in CSA when confronted with less than expected harvests have purchased organic foods to provide households with 'sufficient' quantities of products.

The above characterization of organizational arrangement is somewhat caricatural. Many 'shades of gray' co-exist. For example, in Denmark, 'packages of meat and poultry carry a bar code that, when scanned by a machine in the store, calls up pictures of the farm where the animal was raised, as well as information about its diet, living conditions, the date of its slaughter and so on'.[13] Another example is whether credible certificates and labels on markets allow consumers to overcome some of the critical issues they may be concerned with, *e.g.*, organic, Integrated Pest Management, specific origin, or GMO free products (Caswell and Modjuszka, 1996). In the many shades of gray, a new trend in United States is to have a garden at home in the backyard, without having to garden it by hiring a farmer that will 'weed it weekly and even harvest the bounty, gently placing a box of vegetables on the back porch

[12] In several real world examples, the negotiation of the price takes into account the prices set in other markets, *e.g.*, local markets (Lamine, 2005).

[13] Pollan, M., 2001, Produce politics, The Way we Live Now, *New York Times Magazine*, January, 14, Academic Research Library.

when he leaves' (Severson, 2008). Furthermore, the analysis above assumes that the retail store, CSA and home garden products are substitutes. But if each supply channel is considered as a multi-output technology providing not only food for consumption but also other goods such as leisure, the analysis could lead to different results. For example, home gardens provide other benefits besides just vegetables, such as practicing hobbies or being in the trend (Severson, 2008).

3. Review of the literature and theoretical framework

There is a sizeable general literature in sociology (*e.g.*, De Lind, 1999; Stagl, 2002; Lamine, 2005) and economics (*e.g.*, Cooley and Lass, 1996; Farnsworth et al., 1996; Verhaegen and Van Huylenbroeck, 2001) devoted to alternative supply channels (CSA, farmers' markets, direct selling, etc.). Fewer papers have analyzed CSA arrangements as a possible response to concerns related to global food markets (*e.g.*, O'Hara and Stagl, 2001). Contributions investigating the motives behind households' engagement in a CSA in a rigorous and systematic way are relatively scarce. What follows is a presentation of the main studies and their results. The Cooley and Lass (1996) survey carried out in Amherst Massachusetts asked people (N=192) about their motivations for joining a CSA. The most important reasons were quality of produce, support for local farming, environmental and food safety concerns. O'Hara and Stagl (2001) report the results of a survey involving 74 CSA members in upstate New York. Respondents were asked to rank their motivations for becoming CSA members. The top eight motivations (ranked as very important and important) for joining a CSA were namely 'getting fresh vegetables', 'getting organically grown vegetables', 'wanting to be supportive of local farms', 'having concern for the environment', 'reducing packaging', 'knowing where food comes from' and 'doing something for health'. Other motivations such as 'sharing the risk with farmers' and 'a stronger sense of community' ranked significantly lower as important to indifferent. Interestingly, when compared to a control group, CSA members are 'more concerned about pesticides, have a higher preference for personal interaction when buying food products, and consider themselves more politically active' (O'Hara and Stagl, 2001, p. 548). Bond *et al*. (2006) asked a representative sample of U.S. consumers (N=1,549) to rank their motivations for different channels through an online survey. Unfortunately, the category of CSA members was not distinguished from other kinds of direct purchases, for example local farmers' markets. They report that supporters of local

food systems (30% of the sample) have high expectations for product quality (*e.g.*, freshness, taste, safety) and place high value on supporting local producers.

Unlike the above surveyed literature, our empirical strategy is based on predictions drawn from transaction cost economics. Concretely, we assume that households seek to maximize their utility by selecting the most efficient governance structure. Therefore, the households' decision fits the paradigmatic 'make or buy' decision addressed by the transaction cost economics (TCE) framework: Should a household make its own agricultural products, buy them on the spot market, or maintain an ongoing relationship with a particular supplier? TCE *à la* Barzel predicts a discriminating alignment between the main transaction exchange attributes, namely the measurement difficulty, and the governance mode (Williamson, 1985; 1991; Barzel, 1982, 2005; Anderson and Schmittlein, 1984). Governance arrangements provide means of reducing measurement costs, which are especially significant when transactions include difficult-to-measure characteristics (Darby and Karni, 1973; Barzel, 2005). In other words, the transaction may be organized through different arrangements in order to reduce measurement costs that may ensure a closer correspondence between product value and price (Barzel, 1982).

Unlike Williamson (1985; 2005) who emphasizes dependency between partners caused by dedicated investments in the transaction (asset specificity), the measurement branch of TCE stresses the importance of measuring and enforcing property rights to the specific attributes of complex assets. In any transaction, both the seller and the buyer will require some verification of the measurements of the exchanged goods: the seller to assure himself he is not giving up too much, the buyer to assure himself he is not receiving too little (Barzel, 1982, p. 32). As stressed above, the difficulty to measure and related measurement costs increase when moving from search to experience and to credence characteristics, especially if they are related to a local context. More concretely, we contend that some people do not value similarly fair prices to local farmers and fair prices to farmers, regardless of their location. Moreover, the more attributes are personalized (respectively standardized), the higher (respectively lower) the measurement difficulty (Barzel, 2004). As the hazard posed by measurement issues increases, vertical integration may lower overall measurement costs, by reducing incentives to withhold information.

Nevertheless, there is a tradeoff between economizing on measurement costs and gains from specialization, which defines whether to 'make or buy'. Indeed, if all stages of production are carried out by a single firm (home production), the motive for excess measurement is absent

but advantages of specialization are lost (Barzel, 1982, p. 39). In other terms, for easy-to-measure attributes such as those which are well standardized, spot markets may constitute the less costly organizational arrangement. At the other extreme, when attributes are very difficult to measure, individuals can overcome this difficulty by the 'simple expedient of doing things themselves' in other words, through household production. Between these two extremes, for intermediate level of difficulty to measure, hybrid forms such as long-term relations may constitute the most cost effective method to organize the transaction (Barzel, 1982; 2005).

An important and testable implication can be drawn from the preceding analysis. When difficult-to-measure or individual-tailored attributes are at stake (*e.g.,* local environment, support of 'small' and close producers, local employment, rural lifestyle, 'fair' prices), long term contracting between farmers and consumers can be more transaction cost economizing than the traditional and impersonal retailing. Cooley and Lass (1996) showed that CSA prices are significantly lower than those of groceries.[14] These differences can come from reduced transaction costs, *e.g.*, because CSA arrangements are supported by interpersonal proximity and trust, do not require costly third party certification[15] (Farnsworth *et al.*, 1996) and because households participate in farm tasks[16]. Moreover, CSA participants do not necessarily assess the farm compliance with the negotiated rules, which could be costly, but enjoy the presence of the farmer at each delivery and the formal possibility of visiting the farm (Lamine, 2005).

In the following section we present the survey that was administrated to test our main hypothesis: *The more people are concerned with credence properties of agrofood products, the more likely they are to supply by long term contracting.*

4. An empirical test of the determinants of households' participation in long term contracting with farmers

[14] Noteworthy, a household may incur an increase in other costs such as searching for the products, picking it up and adapting the familial meals to the foodstuffs delivered.

[15] Given that some farms in France (the country of our empirical study) are requested to comply simultaneously with several different standards (*e.g.*, GlobalGAP, BRC, Integrated Farming) rough estimates of certification costs and other related costs (registering day-to-day interventions, filling forms, etc.) can reach several thousands of euros.

[16] Saulny S., Cutting Out the Middlemen, Shoppers Buy Slices of Farms, The New York Times, July 10, 2008, http://www.nytimes.com/2008/07/10/us/10farms.html?pagewanted=print.

In summer 2006, we conducted a mail survey on 264 households located in the metropolitan area of Dijon and Dole (France). These locations, mixing urban and rural communities, offer an 'easy' access to a large array of supply channels (*e.g.*, close supermarkets, local farmers' markets, home gardens, etc.), and have several local communities of farmers involved in conventional and unconventional marketing channels. We surveyed the whole population of CSA participants in Dijon and Dole, which is 89 households. All were committed in long term contracts[17] ($\geq$ 6 months) with local farmers for vegetable supply. We also selected randomly 175 households from the phone directory in the geographic areas covered by the surveyed CSA. Our survey administration procedures are based on a slightly modified Dillman's Tailored Design Method, a high performance survey methodology proven to maximize response rates (Dillman, 2000). Non-CSA members were first contacted by phone then received the questionnaire by regular mail. No recall has been done. CSA members were contacted directly at the delivery point. Thus, people having an interest in issues related to vegetables (*e.g.*, safety) may have been more likely to answer. We received 169 useable responses; 48 from CSA members (53.93%) and 121 from non-CSA members (69.14%).

We asked all respondents to indicate traditional demographic variables (age, sex, income, marital status and so forth), their choice criteria for vegetables and some other questions on their trust in organic and fair trade certification schemes, their level of involvement in associations, and the identity of their main suppliers of vegetables. Specifically, people were asked to answer a question formulated as follows: *'How important is this variable to you in the choice of your vegetables?'*. A 5-point Likert scale was used to measure the importance of quality, price, practical aspects (CSA proximity, opening hours and scope of products), and environmental (less chemical application, less transport) and social considerations (supporting local farming, relationships with the farmers and other consumers).[18] The variables used in estimation, their acronyms, their meaning and general sample statistics are indicated in Table 2. No problem of multicollinearity has been detected.

[17] Of course, one might argue that since people are consuming vegetables for decades, a 6-month contract for delivery is not that long term. Nevertheless, compared to usual purchases of vegetables, CSA arrangements can be considered as hybrid forms in the Williamson typology (2005). Moreover, the volatility of food prices compared to other goods makes a 6-month commitment quite strong. The strength of the commitment is of course higher when the share of food expenses in the household budget is high.

[18] A full version of the questionnaire in French is available upon request.

Table 2: Description of the main variables and sample statistics

Variable	Definition	All households (N=169)		CSA households (N=48)		Non-CSA households (N=121)		χ^2 test[a]
		Mean	SD	Mean	SD	Mean	SD	
Dependent variable								
CSA	Households participating in CSA Dummy variable (=1 if CSA household)	0.284	0.452	1	0	0	0	-
Independent variables								
UNDER35	Respondent's age lower than 35 years Dummy variable (=1 if under 35)	0.207	0.406	0.688	0.468	0.165	0.373	***
OVER3000	Household's income lower than €3,000/month Dummy variable (=1 if over €3,000/month)	0.314	0.465	0.458	0.504	0.256	0.438	**
ASSO	Household committed in associations Dummy variable (=1 if committed)	0.314	0.465	0.542	0.504	0.223	0.418	***
FRESH	Freshness and taste of vegetables as an important criterion Dummy variable (=1 if important criterion)	0.959	0.200	0.979	0.144	0.950	0.218	ns
COSMETIC	Cosmetic aspect as an important criterion Dummy variable (=1 if important criterion)	0.651	0.478	0.438	0.501	0.736	0.443	***
PRICE	Price as an important criterion Dummy variable (=1 if important criterion)	0.473	0.501	0.333	0.476	0.529	0.501	**
PRACTICAL	PROXIMITY as an important criterion OPENING HOURS as an important criterion SCOPE as an important criterion Dummy variables (=1 if important criterion)	0.497 0.314 0.680	0.501 0.465 0.468	0.521 0.372 0.769	0.502 0.485 0.423	0.438 0.167 0.458	0.501 0.377 0.504	ns *** ***
ENV	Environmental considerations (less chemical application, less transport) as an important criterion Dummy variable (=1 if important criterion)	0.740	0.440	0.958	0.202	0.653	0.478	***
SOCIAL	Social considerations (supporting local farming, personal relationships with the farmers and other consumers) as an important criterion Dummy variable (=1 if important criterion)	0.817	0.388	0.958	0.202	0.760	0.429	***

[a] The test compares CSA and non CSA households: (ns) stands for not significant, (**) and (***) stand for significant at 5% and 1% levels, respectively.

We did chi-square tests to compare CSA and non-CSA households. The results indicate (i) that CSA households are younger, have higher incomes and are more active in associations that non-CSA households, and (ii) that non-CSA households are more concerned by cosmetic and price attributes than their CSA counterparts who care more for opening, scope, environmental and social attributes. Concerning our hypothesis on the role of search, experience and credence attributes, simple chi-square tests provide support in that CSA households care more for difficult-to-measure attributes (environmental and social). We carry out further investigation to provide more control.

To investigate empirically the determinants of households' participation in long term contracting with farmers for vegetable supply, let us consider the household choice in a random utility model. We specify a linear model for the underlying economic variable driving participation (a latent, unobserved variable):

$$Y_i^* = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \varepsilon_i \text{ with } i=1,2,...N \quad (1)$$

where X_{1i} represents a vector of variables for households' characteristics (age, income, involvement in associations), X_{2i} captures search and experience attributes (freshness and taste of vegetables, cosmetic aspects, price, practical aspects [proximity, opening hours, number of products proposed]), and X_{3i} credence attributes (environmental and social considerations). β_1 to β_3 represent slope coefficients to be estimated, and α and ε represent the intercept and the error term, respectively. The interpretation of the latent variable in this kind of model is typically that of an overall net utility originating from participation in CSA. When this latent variable is positive, participation gains outweigh losses due to participation. Thus, the model of participation for the households can be stated as a discrete-choice model with the dummy variable indicating participation, *CSA*, as the dependent variable Y_i :

$$\begin{cases} Y_i = 1 \quad if \quad Y_i^* > 0, \\ Y_i = 0 \quad otherwise. \end{cases} \quad (2)$$

We specify a logistic distribution for ε and maximize the log-likelihood of the Logit model (Greene, 2003), to estimate model parameters up to a constant. Logit estimation results are presented in Table 3, together with goodness-of-fit measures (Maximum-Likelihood estimation).

Table 3: Logit model of households' participation in long term contracting for vegetables supply

Variables	Parameter estimate	z-values	Marginal effect	SD
INTERCEPT	-7.215***	-3.12	–	–
UNDER35	1.870***	3.62	0.243***	0.074
OVER3000	0.792	1.60	0.110	0.076
ASSO	1.456***	2.77	0.219**	0.094
FRESH	1.834	1.05	0.127**	0.060
COSMETIC	-0.879*	-1.73	-0.121	0.080
PRICE	0.210	0.42	0.026	0.063
PROXIMITY	0.255	0.50	0.032	0.064
OPENING HOURS	-0.503	-0.87	-0.059	0.063
SCOPE	-1.752***	-3.33	-0.271***	0.096
ENV	2.880***	3.35	0.245***	0.055
SOCIAL	1.997**	2.04	0.165***	0.052
McFadden R2	0.4059			
-2 log L	119.825			
-2 log L (Intercept only)	201.689			
Likelihood ratio	81.86*** (DF=9)			
Percent concordant	85.80			
Sensitivity	66.67			
Specificity	93.39			
Number of observations	169			
Number of CSA households	48			

(*), (**) and (***) stand for parameter significance at the 10%, 5% and 1% level respectively. The marginal effect for a binary explanatory variable is computed as the difference of the two probabilities associated with the discrete change between 0 and 1 for that variable. Marginal effects are computed at the sample mean.

To better interpret the sensitivity of the probability of participation with respect to explanatory variables, we also report marginal effects (right-hand side of Table 3). For continuous explanatory variables, marginal effects measure the change in the estimated probability following an increase of the explanatory variable by 1 unit. For discrete variables however, the marginal effect is calculated as the difference between the probabilities estimated at the sample means when the dummy variable takes the values of 1 and 0, respectively. The percentage of correct predictions, the sensitivity and specificity are satisfactory. The McFadden R2 of 0.31 indicates that unobserved individual heterogeneity is still relatively important in the data.

The chi-squared statistic for the hypothesis test of all coefficients being equal to zero is significant above the level of 1%. We are now in a position to convey information about the impact of each independent variable on CSA participation, based on the parameter estimates, statistical significance and marginal effects[19]. Being under 35 and being involved in associations increase the probability *ceteris paribus*, that the household will belong to a CSA. These findings might also reflect the way by which new members are informed and recruited, that is through relationships in specific social networks. These results are useful for CSA promoters who may improve the targeting of their recruitment rather than adopting a 'one-size-fits-all' approach.

To test for the main hypothesis of the paper that households concerned with credence attributes of goods are more likely to become CSA members, we introduced in the model a measure of household concerns for attributes that are mainly search or experience ones (freshness and taste of vegetables, cosmetic aspects, price, practical aspects) and for attributes that are mainly credence ones (environmental and social considerations). Results in Table 3 indicate that the probability of participation in a CSA is negatively affected when households care for cosmetic aspects of goods and the scope of products. The scope of products is the dominant variable (in the sense of the largest marginal effect), followed by environmental considerations. In other terms, the number of products offered may prevent people from participating in a CSA arrangement. Consequently, promoting CSA among households may require caring about this aspect, by increasing the choice set and improving the cosmetic aspects of vegetables. Interestingly, in France, some CSA farms join their efforts to propose a broader range of products. According to our estimation, proximity and opening hours play no significant role. Therefore, targeting households close to the CSA delivery point or alternatively selecting an appropriate delivery point (*e.g.*, home or workplace delivery) may not be so crucial to increase CSA market penetration. In addition, given the recentness of CSA in France compared to Japan or USA, it is possible that the first wave of French households are less exigent and more involved. Other search/experience attributes (freshness, price) play no significant role in the decision to enroll in a CSA. Freshness and price may not be the drivers of CSA participation. These results probably show that, in our sample, prices and freshness are perceived as equivalent in CSA and other supply channels.

[19] Several versions of the model have been estimated to investigate the robustness of results to the omission of some variables. The main results remain unchanged.

Environmental and social credence attributes are statistically significant drivers of CSA commitment. Households sensitive to environmental and local social issues are more likely to participate in CSA arrangements, *ceteris paribus*. Consequently, our main hypothesis is not rejected: *the more people are concerned with credence properties of agrofood products, the more likely they are to supply by long term contracting.* Thus, giving households the opportunity to control more precisely the way their food is produced and get what they want in comparison to more 'impersonal markets' could constitute a strong argument in favor of CSA. Moreover, emphasizing the environmental and social benefits of CSA arrangements,[20] especially at the local level, may constitute a strong argument for promoting households' participation.

5. Conclusion and future directions

Long term contracts between farmers and consumers are an institutional innovation likely to reduce measurement costs. Because some difficult-to-measure characteristics desired by concerned households are not well addressed by traditional retailers, CSA can constitute a more cost-effective means to achieve the transaction. Nevertheless, food quality is evolving and the classification of a salient attribute as search, experience or credence changes over time. Consequently, transactions mediated through a given channel are likely to evolve over time. Our results also provide guidance to CSA promoters in order to improve practical services associated with CSA participation (scope of products, cosmetic aspects) and target their efforts towards households that are more likely to participate.

Our contribution shows that environmental considerations play a major role in explaining households' participation in CSA arrangements. Nevertheless, we do not investigate the objective environmental performance of these initiatives and whether these decentralized arrangements are sufficient to ensure an acceptable level of environmental protection. A fundamental issue not analyzed in this contribution is whether the face-to-face trust system is effective and whether the farms engaged in the CSA business are really delivering their environmental and social commitments. Unfulfilled promises means that the CSA model is providing sub-optimal outcomes for the consumers choosing them for their credence attributes. Indeed, people can be cheated and will eventually find out and stop participating in

[20] Even if the claimed benefits are scientifically contentious (Smith *et al*., 2005; Blanke and Burdick, 2005; Schlich *et al*., 2006).

CSAs, or they are participating for some other reasons, allowing this arrangement to go on. A detailed analysis of the welfare effects of CSA also needs an investigation of the supply side. What are the production effects of CSA participation for farmers in terms of input use and land allocation? How does CSA compare to other price and production risk mitigation devices such as insurance or agricultural policies? These interesting questions would provide keys to assess the real environmental impacts of CSA participation.

Our analysis has some limitations that deserve further research. Investigating the patterns of home production (corresponding to hierarchy) that was not feasible because of data limitations, may constitute a natural extension. CSA can also constitute a more efficient way (compared to traditional retailing) of provision of public goods, such as the local environment quality tied with private benefits such as freshness, greater taste and nutritional qualities. Interestingly, it seems necessary that future studies devote special attention to the overlap between the (local/global) public/private dimension and search/experience/credence dimension[21]. Moreover, alternative organizational arrangements have major implications for the allocation of created value among agents of the food chain. Policy makers aiming at ensuring sufficient revenues for farmers may be interested in these hybrid forms that may reshape food chain supply and allow an alternative value repartition among agents.

[21] For example, investigating whether households participating in a CSA have stronger concerns over private credence characteristics (*e.g.*, less pesticides) or over public credence characteristics (*e.g.*, less CO2 emissions) can constitute a fruitful extension.

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