International Food and Agribusiness Management Review

Official Journal of the International
Food and Agribusiness Management Association

Volume 18 Issue 1
2015

INVESTING IN THE FUTURE OF RURAL AMERICA

At CHS, we're committed to creating a strong future–and strong future leaders–for rural America and giving back to our communities with our time, talent and resources. To learn more about how CHS is helping cultivate the future today, visit chsinc.com/stewardship.

CHS®

International Food and Agribusiness Management Review

Editorial Staff

The IFAMR (ISSN #: 1559-2448) is published quarterly and is available at http://www.ifama.org. For copyright and publishing information, please contact: Kathryn White, Administrative Editor. IFAMA Business Office • 1010 Vermont Avenue, Suite 201, Washington, DC 20005 • USA • Tel: 1 (202) 429-1610 • Fax: 1 (202) 628.9044 • E-mail: ifamr@ifama.org • Web: http://www.ifama.org

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

TABLE OF CONTENTS

Research

Case Studies

International Food and Agribusiness Management Review

The IFAMR Open Access Project is supported in part through contributions from these institutions. Scholars, practitioners, students, and policymakers may now read and download the most current and archival content from the IFAMR website. The Board of Directors of the International Food and Agribusiness Management Association feel that open and immediate access to IFAMR's articles and case studies dramatically elevates the quality of scientific inquiry and instruction around the world in the field of agribusiness. If you would like to support this effort please contact: **Kathryn White, Email: ifamr@ifama.org.**

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

EDITOR'S NOTE

Dear Colleagues,

We have another great issue that pushes some important boundaries, but first I need to congratulate IFAMA and the IFAMR on our best year ever. Our mission is to provide food and agribusiness scholars with a platform to maximize the impact of their work and 2014 closed with more submissions than ever—up 11% over last year, and up five-fold over the last six years! And we published more of your work setting a new high water mark, 10% above our previous best in 2012. We produced four regular issues and two special issues—one working with members from Economic Research Service (ERS/USDA) on issues concerning Food and Health; and a second containing a collection of case studies on successful African entrepreneurship. We have also purposefully increased our distribution and reviewers outside our traditional base, and added a fabulous South African Managing Editor, Ajuruchukwu Obi. As a result we have quietly increased the number of scholars (one third) publishing with us from outside North America and Europe, up 45% over the last three years. By the way, we now have the highest Impact Factor among peer journals ☺.

Be on the lookout for an upcoming Special Issue produced by members from ERS looking at the dynamic global poultry industry.

I'd like to thank Corrine Alexander, a professor from Purdue University and a longtime Managing Editor, who will be stepping down this year. What a great asset she has been to the IFAMR, and critical to its recent growth and development. At the same time we welcome our newest Managing Editor, Michael Gunderson, Associate Professor and Associate Director of Research for the Center for Food and Agricultural Business at Purdue University. It's great to have Michael on our team.

Now onto this great issue. Let me draw your attention three articles from Asia. The first is a great case study from China on the Smithfield acquisition by Shuanghui International. The second is a very tight case study on a dairy processor in Tajikistan. Both will make nice additions to your teaching materials. A third article from China introduces a unique analysis of cooperative behavior and member commitment.

There is a lot more in this issue and I wish you happy reading!

Peter Goldsmith, Executive Editor, IFAMR

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

The Hidden Benefits of Short Food Supply Chains: Farmers' Markets Density and Body Mass Index in Italy

Francesco Bimbo[ⓘa], Alessandro Bonanno[b], Gianluca Nardone[c], and Rosaria Viscecchia[d]

[a] *Postdoctoral Researcher, University of Foggia, Department of the Sciences of Agriculture, Food and Environment, Via Napoli 25, Foggia, 71122, Italy*
and
Doctoral Candidate, Business Economics Group, School of Social Sciences, Wageningen University, Hollandseweg 1, Room 6040, P.O. Box 8130, 6706 KN, Wageningen, The Netherlands

[b] *Assistant Professor of Business Economics, Business Economics Group, School of Social Sciences, Wageningen University, Hollandseweg 1, Room 6040, P.O. Box 8130, 6706 KN, Wageningen, The Netherlands*
and
Adjunct Assistant Professor, Department of Agricultural Economics Sociology and Education, Pennsylvania State University, Armsby Building, University Park, Pennsylvania, 16802, USA

[c] *Full Professor, University of Foggia, Department of the Sciences of Agriculture, Food and Environment, Via Napoli 25, Foggia, 71122, Italy*

[d] *Assistant Professor, University of Foggia, Department of the Sciences of Agriculture, Food and Environment, Via Napoli 25, Foggia, 71122, Italy*

Abstract

As more farmers adopt short distribution channels, consumers may benefit from them insofar as they increase access to healthier food options. This may lead to potential societal benefits via a reduction in obesity rates. The relationship between the presence of farmers' markets and adult Italians' Body Mass Index (BMI) was assessed by applying quantile regression on a cross-sectional, individual-level database, matched with regional farmers' markets density figures. Findings illustrate that for most adult Italians, a higher density of farmers' markets is associated with lower BMIs and that this relationship becomes more marked for individuals with higher BMIs facing limited supermarket access.

Keywords: farmers' markets, BMI, obesity, supermarket access, quantile regression

ⓘCorresponding author: Tel: + 1. 39 0881589316
Email: F. Bimbo: francesco.bimbo@unifg.it
A. Bonanno: alessandro.bonanno@wur.nl
G. Nardone: gianluca.nardone@unifg.it
R. Viscecchia: rosaria.viscecchia@unifg.it

Introduction

The term Short Food Supply Chain (SFSC) refers to any form of direct sale from farmers to consumer (Ilbery and Maye 2005), and it is often used in opposition to mainstream global food supply systems based on large-scale production and product standardization. SFSCs encompass multiple sales schemes such as: on-farm direct sales, farmers' shops, farmers' markets (hereafter FMs), and partnerships between producers and consumers, all aimed to minimize the number of intermediaries. On average, farms involved in SFSC activities are small-scale businesses with less than 10 hectares, typically joining in a scheme that involves less than 10 producers (Kneafsey et al. 2013).

Farmers' participation in SFSCs is increasing in developed countries. During the period between 1994 and 2009, the number of FMs in the United States has more than tripled from 1,755 to 5,274 business units (Martinez et al. 2010). The European Union presents growing numbers of SFSC schemes, whose presence varies, however, by country (Kneafsey et al. 2013). Italy presents an interesting case, as it is one of the EU member countries to have introduced a specific legislative decree for the regulations of FMs (Kneafsey et al. 2013), and the demand for products supplied via short channels is growing. According to Coldiretti, the largest Italian farmers' association, the number of Italian consumers shopping at SFSCs is sizeable: about 1 in 6 Italians (circa 9.2 million) shopped at an FM at least once in 2011 (Coldiretti 2012). SFSCs' adoption in Italy is growing: in 2009 in Italy there were circa 63,600 Italian farms practicing on-farm direct sales twice the number recorded in 2001 (Coldiretti 2009), while the number of Italian FMs' doubled between 2009 and 2012 from 550 to 1105 (Coldiretti 2012).

From a business stand point, SFSCs give farmers an opportunity to avoid middlemen and retailers and, as a result, to internalize larger margins, as well as to have direct access to consumers who are more willing to pay for locally produced foods (Gilg and Battershill 1998). Participation in SFSCs may help farmers to survive during periods of crisis since they may retain a higher share of profits compared to those they acquire when taking part in a regular supply chain (La Trobe 2001). Farms' participation in SFSCs seems to have beneficial societal spillovers: for example, shopping at FMs increases customer satisfaction due to freshness and quality of products (Govindasamy et al. 2002), reconnects people to the local community (Gale 1997), and facilitates social interaction, thus promoting the development of trust and social capital (Hunt 2007).

Although there exists a considerable number of analyses of the beneficial societal effects of SFSCs (see Brown 2002; Brown and Miller 2008 for literature reviews), there is only limited research assessing their potential impact on consumers' diets. Pascucci et al., (2011) found that FM shoppers report an increased consumption of organic products, while Hawkes et al., (2012) indicate that SFSCs may have a positive impact on consumers' health. Improved access to FMs leads to an increased consumption of healthy foods such as fruit, vegetables, and wholesome foods, which could, in turn, result in a better nourished population (*e.g.* Frieden et al. 2010). U.S.

studies have shown that higher densities of FMs' and Community Supported Agriculture[1] are inversely related to individual weight outcomes (Berning 2012) and that SFSCs have a negative association with obesity rates and diabetes prevalence (Salois 2012).

If the presence of SFSCs improves access to healthier food options, it may play a role in ameliorating diets in developed countries where growing obesity rates have become one of the biggest health concerns. With increasing overweight and obesity rates, expressed as the percentage of the adult population with a Body Mass Index (BMI)[2] greater or equal than 24.9 and 30 (respectively), policymakers have taken action to reduce the social cost of the phenomenon, due to the growing demand for health-care services and lower labor productivity (Fry and Finley 2005).[3] In spite of the fact that academics have studied the role played by the food environment[4] on diets and obesity, in particular in the United States (see White 2007, for a literature review), the European Commission's actions to prevent and mitigate obesity have downplayed this role. In the context of diet and health measures, Traill (2012) finds that in the European Union, about two thirds of activities focus on supporting informed choices (*e.g.* advertising controls, nutrition education campaigns, and changes in food labelling) and only 2 out of 121 policies are directed to improve food availability for disadvantaged consumers. In spite of the fact that consumers need information, access, and choice to select healthy foods effectively (*e.g.*, Mazzocchi and Traill 2005), little has been done in Europe to improve access to healthy foods.

The goal of this study is to assess whether the presence of FMs is associated with lower values of BMI among adult Italians. We use a cross-sectional database of individual-level observations from the Multipurpose Survey of Households (ISTAT), matched with regional data on FMs' density, measured as the number of establishments per 100,000 inhabitants. As limited access to supermarkets can constitute a barrier to healthy diets and foster obesity (Moore and Diez Roux 2006), variables capturing households' hardship to reach supermarkets were interacted with FMs' density, under the hypothesis that those who have less (more) access to supermarkets may benefit more (less) from the presence of FMs. Following Pieroni and Salmasi's (2014) analysis of the relationship between fast food restaurants' presence and adult BMI in the UK, we used quantile regression to account for the changing relationship between FMs and BMIs at different levels of BMI. As FMs' may locate preferentially in areas of higher produce demand for produce, and since individuals' higher consumption of fruits and vegetables may result in lower BMIs (*e.g.* Lin and Morrison 2004; Rolls et al. 2004), the number of daily portions of fruits and vegetables' consumed are included to mitigate spurious correlation between FMs' density and BMI. Furthermore, the inclusion of socio-economic variables and other behavioral factors, as

[1] Community Supported Agriculture requires contractual agreement between a farm and a group of consumers who purchase a "share" of a farms' production in advance. This allows farmers to plan production for a guaranteed market and have the resources upfront for the purchase of inputs (Cone and Myhre 2009).

[2] The Body Mass Index (BMI) is measured as the ratio of a person's weight in kilograms divided by the square of his height in meters (kg/m2) (WHO, 2007).

[3] The estimated annual direct costs of medical expenses associated with overweight and obesity in the United States are $147 billion while in the EU-15 they amount to circa €100 billion (Fry and Finley 2005; Hammond and Levine 2010).

[4] Cummins and Macintyre (2006) define the food environment as those factors influencing the availability of (or consumers' ability to access to) food that can be consumed at home and ready-to-eat food consumed away from home.

well as regional fixed-effects, reduced further the likelihood of unobserved factors influencing consumers' diets and BMI. Nevertheless, this analysis measures the association between FMs density and BMI without implying the existence of a causal relationship.

The Italian case study was chosen for two reasons. First, only a limited number of analyses exist investigating how the food environment impacts obesity in Europe (*e.g.* Bimbo et al. 2012; Pieroni and Salmasi 2014) and in particular, in Italy (Bimbo et al. 2012). Second, there is a large disparity in the geographic diffusion of FMs in Italy, which mirrors adult BMIs: as shown in Table 1, Southern and Islands' regions present the highest BMIs, the lowest number of portions of fruit and vegetables consumed, and the lowest density of FMs. These patterns are reversed in the North-East.

Table 1. BMI, fruit and vegetables consumption, and farmers' market density across Italian macro-areas.

Area	BMI	Fruit and vegetables[1]	Farmers' market density
North East	24.87	2.34	1.40
North West	24.92	2.30	1.01
Center	25.10	2.35	0.92
South	25.70	2.08	0.56
Islands	25.38	2.19	0.45
Total	25.17	2.25	0.93

Source. Authors' own elaboration from MHS and Coldiretti data.
[1] Daily portions consumed

The next section illustrates the empirical model, followed by a discussion of the data and estimation technique used in the analysis. The empirical results and their discussion follow while a section that includes conclusions and results' implications (and their limitations) will conclude the paper.

Empirical Model

To explore the association between SFSCs and adult Italian BMI, a simple linear empirical relation was posited based upon previous literature (*e.g.* Courtemanche and Carden 2011). The relationship between the BMI of adult Italian *i* in region *r* and a series of covariates explaining it is:

$$BMI_{ir} = \alpha + \sum_{d=1}^{D} \alpha_{AFM_d} ACC_{ir}^{d} FMD_r + \alpha_{FV} FVport_{ir} + \sum_{k=1}^{K} \alpha_{SE_k} SE_{kir} + \sum_{l=1}^{L} \alpha_{BE_l} BE_{irl} + \sum_{r=1}^{R} \alpha_{REG_r} REG_r + \varepsilon_{ir} \quad (1)$$

where αs are parameters to be estimated, ε_{ir} is an error term, and the other terms are explained below.

FMDr measures FMs' density, the number of FMs in region *r* divided by its population. The FMs' presence was expected to be negatively related to adult BMI as long as access to the short supply chain allows consumers to substitute for high caloric food and promote their consumption of healthier options (Berning 2012). As individuals are exposed to a multitude of food outlets, it was hypothesized that the relationship between BMI and FM presence may also be conditional on consumers' access to traditional food stores. The hypothesis is that FMs presence may have, relatively speaking, a larger effect in terms of supporting lower body weight on those who have fewer alternatives regarding where to buy food; that is, it was expected that FMs would have a more pronounced relationship with BMI for individuals with lower levels of access (Larsen and Gilliland 2009). Thus, in equation (1), *FMD* interacts with *i*s' declared level of hardship to reach supermarkets ACC_{ir}^{d} (d=1,..,D), representing a declared level of hardship, as discussed below, used as a proxy for the lack of access to other food stores.

FVport represents the number of daily portions of fruit and vegetables consumed. Fruit and vegetables consumption affects negatively adult BMI (Lin and Morrison 2004; Key et al. 2006) and it is also included in the model to reduce the spurious correlation between FMs' density and BMI. *SE* is a control vector of consumers' socio-economic characteristics (*e.g.* Drewnowski and Darmon 2005; Loureiro and Nayga 2005; Banterle and Cavaliere 2009). *BE* is a vector of *L* individual behavioral variables that are expected to have an impact on adult BMI, such as smoking habits, practicing sport, and time spent watching television (Lakdawalla and Philipson 2009; WHO 2004). *REG* are regional fixed-effects, to capture unobservable differences in diets across regions, as well as other unobserved factors that may affect adult Italians' BMI.

Data and Estimation

The main database used in our analysis is derived from one year (2009) of individual-level observations of the Multipurpose Household Survey (MHS) collected by the Italian National Bureau of Statistics (ISTAT). This survey uses a paper-and-pencil interview (PAPI) technique and is based on a face to face interview questionnaire and a self-administered questionnaire. The survey has taken place annually since 1993 and collects information on households and individuals characteristics (*e.g.* age, gender, level of education, smoking habits, practicing sport, and time spent watching television, etc.), as well as self-reported data on weight and height, which, for adult respondents, permits the calculation of BMI.[5] The survey sample was designed to be representative of Italian households at the national and regional level. The individual-level MHS data were matched with regional-level data on FMs' locations obtained from the Campagna Amica Foundation by Coldiretti, which encompasses circa 90% of the Italian FMs. FM density, *FMD*, was obtained by dividing the number of FMs by the region-level population in 100,000, from ISTAT. As indicated in the previous section, *FMD* is interacted with perceived access indicators form the MHS, capturing self-reported household-specific hurdles to reach a supermarket, classified as "no hurdles" (ACC^{NH}), "some hurdles" (ACC^{SH}) and "considerable hurdles" (ACC^{CH}).[6]

[5] As discussed elsewhere in the literature (*e.g.* Hansstein et al. 2009), the self-reported height and weight measures from the MHS are likely to result in downward bias values of BMIs.

[6] MHS respondents are asked to declare their household's level of hardship in reaching a supermarket. The answers allowed are: no hurdles; some hurdles; considerable hurdles; I don't know. Observations for respondents responding "I don't know" were excluded from the data.

The MHS database also contains information on daily portions of fruit and vegetables consumed by each respondent (variable *FVport*). The other variables in the vectors *BE* and *SE* come from the MHS (except income) and are household size, age, age squared, gender (female), respondents' years of education, number of hours spent in front of the TV (as a proxy for inactive time), and indicators capturing marital status, smoking, and practicing sport regularly. As the MHS contains information on each individual's line of employment, a proxy was constructed for per-capita household income matched with regional statistics on net retributions by employment type (from the ISTAT Data warehouse 2009) for each individual, summing across household members divided by household size.[7] Observations with missing values and those of individuals below 18 years of age were dropped, since, for these, weight and height were not recorded. In order to mitigate the inclusion of individuals' misreporting of weight, height, and fruits and vegetables consumption, as well as those who may be dieting, we excluded from the analysis individuals with BMI > 30 (BMI<18.5) who claimed to consume more than 4 (less than 2) daily servings of fruits and vegetables. The total number of observations excluded was 259, less than 1.2% of the entire sample. The final sample contained 21,312 observations. Variables' descriptions and summary statistics are presented in Table 2.

One can obtain estimates of equation (1)'s parameters using Ordinary Least Squares (OLS), however, the estimated parameters would only represent the *average* effect of the explanatory variables related to adult Italians' BMI. As others have shown (*e.g.* Pieroni and Salmasi 2014), the relationship between BMI, the food environment, and individual characteristics may be non-linear: for example, the relationship between FMs and BMI may be more (less) marked for those individuals who have higher (lower) BMI. To obtain estimates of the relationship between FMs (as well as other covariates) and BMI at different points of its distribution, a quantile regression technique was employed (Koenker and Bassett 1978).[8]

$$(2)\quad \min_{\alpha \in \mathbb{R}^k} \left[\sum_{i \in \{BMI_i \geq X'\alpha\}} \theta |BMI_i - X'\alpha| + \sum_{i \in \{BMI_i \leq X'\alpha\}} (1-\theta) |BMI_i - X'\alpha| \right]$$

As is customary in analyses using quantile regression (*e.g.* Atella et al. 2008; Villar and Quintana-Domeque 2009; Pieroni and Salmasi 2014), the model parameters were evaluated at the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentile of the dependent variable distribution. All the estimation and data manipulation were performed in STATA v. 10.

[7] An income proxy was imputed for retirees using individual's "previous line of employment" matched with the average pensions for each profession from ISTAT. Households with zero income were dropped from the database.
[8] Furthermore, quantile regression exploits the differences in the relationship between dependent and independent variables, which, if not accounted for, could lead to issues of heteroskedasticity. In our case, non-constant variance of the error terms obtained via OLS was detected by means of the Breusch-Pagan/Cook-Weisberg test.

Table 2. Variables used in the estimation (N =21312).

Variable	Variable Description	Mean	Std. Dev.	Min	Max
BMI	Body Mass Index	25.31	3.65	15.6	41.7
FMD	Farmers' market density	0.93	0.51	0.0	1.9
ACC^{NH}	No hurdles to access supermarkets	0.70	0.32	0	1
ACC^{SH}	Some hurdles to access supermarkets	0.23	0.42	0	1
ACC^{CH}	Considerable hurdles to access supermarkets	0.07	0.26	0	1
FVport	Daily portions of fruits and vegetables consumed	2.26	1.41	0	16
House size	Number of household members	2.89	1.25	1	12
Age	Respondent's age	51.17	17.22	18.0	102
Age^2	Respondent's age square	2914.32	1846.01	324.0	10404.0
Female	Gender (Female=1)	0.41	0.49	0	1
Educ. Years	Years of education	10.04	4.50	0	21
Married	Marital status (Married=1)	0.61	0.49	0	1
Smoke	Smoking habits (Smoker=1)	0.25	0.44	0	1
Sport	Practice sport regularly (Yes=1)	0.19	0.39	0	1
TV Hrs	Daily hours spent watching television	2.81	1.68	0.0	15.0
Income	Annual income in 10,000€	1.79	0.48	0.8	3.4

Source. Authors' own elaboration from ISTAT and Coldiretti data.

Empirical Results and Discussion

Table 3 (see Appendix) presents the estimated parameters of equation 1 obtained via OLS (first column) and at the different percentiles of the BMI distribution (second to sixth columns) obtained using quantile regression, along with bootstrapped standard errors.[9] The R-squared in our models ranges between 7.3%-17.9%; albeit low, given cross-sectional nature of the data used and the finality of our study,[10] such range is acceptable. The values of the test statistics for the equality of the coefficients across quantiles are reported in the last two columns and indicate that for only 4 of the 21 estimated parameters (excluding fixed-effects) the null that they are statistically equal across quantiles cannot be rejected. Thus, the data support the use of quantile regression in place of OLS, as the relationship between the explanatory variables and BMI varies

[9] Two hundred random draws were taken to estimate the standard errors.

[10] Large R-squared would be preferable if one's goal was to make "*correct*" predictions of an individual's BMI. However, the focus of this analysis is to assessing the relationship between adult BMI and FMs' density. We thank an anonymous referee for raising this point.

along the distribution of the latter. The values of Italian adult BMI demarking the percentiles used in quantile regression are: 20.81 (10%); 22.72 (25%); 24.97 (50%); 27.47 (75%); and 30.07 (90%). Thus, the estimated coefficients at the 50th quantile represent the effect of the explanatory variables on the BMI of borderline overweight individuals; those at the 75th quantile represent the effect on the BMI of overweight individuals; while those obtained at the 90th quantile represent the effect on BMI for individuals classified as obese.

The OLS coefficients show that FMD has an inverse relationship with Italian adult BMI, the magnitude of which becomes larger for individuals in households with considerable hurdles in accessing supermarkets (from -0.26 to -0.39). The estimated quantile regression coefficients show patterns similar to OLS ones, although differing across quantiles. At the lowest (10th) quantile of the BMI distribution, FMD does not seem to be related to Italian adults' BMI; negative and statistically significant coefficients are instead found from the 25th percentile onward. It should, however, be noted that we find weak evidence of FMs being related to adults' BMI for those individuals in households declaring some hurdles in accessing supermarkets. For these individuals, FMs have a negative and significant correlation with BMI only at the 75th and 90th BMI percentile (-0.286 and -0.359 points, respectively).

The presence of FMs shows an inverse relationship with the BMI of those individuals living in households with easy access to supermarkets (estimated coefficients are -0.205 and -0.199 for the 25th and 50th BMI percentile, respectively). At the same quantiles, the FM coefficients for individuals living in households with considerable hurdles in accessing supermarkets are one third larger: -0.297 (25th percentile) and -0.279 (50th percentile). For individuals in households with considerable hurdles in accessing supermarkets, the magnitude of the FM density effect is larger, indicating that one additional FM for 100,000 individuals would result in -0.518 and -0.652 BMI points for overweight and obese individuals, respectively. Overall, these results indicate that adult Italians with higher BMIs who are severely underserved by traditional food outlets may benefit the most from the presence of FMs, while those who have lower BMIs and live in households with limited (or no) hurdles in accessing traditional food stores benefit less.

Focusing on the other control variables, the OLS and quantile regression coefficients show signs that are consistent with previous literature. The number of daily portions of fruit and vegetables consumed is associated with lower BMIs, with a negative and statistically significant OLS coefficient (-0.049), and a gradient of quantile coefficients varying from non-statistically significant at BMI percentiles indicating normal weight, to negative and significant and a larger magnitude as one moves toward higher BMIs. The estimated coefficient is -0.03 for borderline overweight individuals (50th percentile), -0.056 for overweight individuals (75th percentile), and -0.16 for obese individuals (90th percentile). Thus, people with an above average BMI may benefit more than others from an extra daily serving of fruit and vegetables, and the benefit grows as the BMI increases. In spite of the fact that the consumption of fruit and vegetables has been shown to promote BMI reduction (see Lin and Morrison 2004; Rolls et al. 2004), results indicated that its effect is likely to vary based on an individual's BMI.

The estimated parameters for the socio-economic and behavioral variables are in line with previous literature (e.g. Costa-Font and Gil 2008; Baum and Ruhm 2009). For brevity, this discussion will focus only on quantile regression estimates. Household size affects positively

adult Italians' BMI, however, only for individuals at or above the 50th percentile of the BMI distribution. Furthermore, results show that being female and well educated is inversely related to BMI across all quantiles, while age (age squared) shows a positive (negative) association with it. The effect of years of education on BMI is always negative and statistically significant; the magnitude of this relationship grows from the lowest to the highest percentile (-0.057 to -0.126). Surprisingly, marital status shows a negative and statistically significant correlation with BMI for individuals only above the 75th percentile of the BMI distribution.

Also, smoking and practicing sport were found to have an inverse relationship with BMI; we find the largest negative association between smoking habits and BMI at the 25th and 90th percentiles of the latter's distribution, indicating that some non-linear relationship between smoking and BMI exists. Practicing sport shows a negative correlation with adult Italians' BMI, and the effect becomes larger with the BMI: the estimated coefficient for obese individuals (90th percentile) is -1.13, more than five times that estimated for normal weight individuals (25th percentile, -0.22). Similarly, hours spent watching TV is positively correlated with BMI, and the magnitude becomes larger with the percentiles (0.05 for the 25th percentile and 0.205 for the 90th). Last, income shows a negative and statistically significant relationship with adult BMI only for obese individuals (90th percentile). This result suggests that an increase in income may not necessarily translate into consumption of healthier foods as found by Drewnowski (2007).

Conclusion and Implication

In this paper, we investigated a potential societal benefit of the existence of SFSCs, the relationship between farmers' markets presence, and BMIs among adult Italians, using a cross sectional micro-level database of adult Italians' characteristics and habits (Multipurpose Household Survey - 2009) matched with regional data on farmers' market density and a quantile regression approach. The empirical results point to an inverse relationship between farmers' market density and adult Italians' BMIs, a relationship that strengthens at the higher percentiles of the BMI distribution. Disparity in access to traditional food stores affects this relationship, which becomes more marked for individuals living in households that face considerable difficulties reaching supermarkets compared to those declaring none or some hurdles.

The results support the beneficial effect of SFSCs on human health already found in the literature (Berning 2012; Salois 2012), and they could be used to promote SFSCs in general and FMs in particular. SFSC managers could promote FMs' expansion as a tool to help foster healthy choices and consumers, going beyond the traditional portrayal of them as instruments to increase farmers' income. This strategy may be particularly successful when it is emphasized that the beneficial effects may be larger for individuals who are in need of ways to engage in healthier diets (higher BMIs) or who face hurdles when it comes to accessing traditional food stores.

In light of the results illustrated here, policymakers may pursue the possibility of adopting measures that facilitate the development, performance, and continuity of SFSCs as a means to support consumers' wellbeing. This goal could be pursued in different ways. First, governments may directly support SFSCs by employing public "local" procurement schemes, increasing local food producers' profitability, as well as the nutritional quality of food served in public institutions and people's wellbeing. Public procurements are already regulated by law (EU

Procurement Directive 2004/18) and promoted as a policy tool to curb obesity, and some national and regional authorities in Italy are experimenting with a minimum share of products "locally sourced" or of "local origin" with the aim of improving people's health and local farmers' income (ENRD 2012). Second, institutions may indirectly sustain the diffusion of SFSCs' products by offering farmers education and extension services to help them with risky events (*i.e.* adverse weather conditions, infestants, and compliance with standards), which often prevent products' marketability and consumer acceptance (Gregoire et al. 2005; Tropp and Barham 2008; Shipman 2009). Third, local and regional institutions may help farmers to develop managerial skills, such as communication ability, market analysis, and commercial management (Hass et al. 2013). Promoting farmers' managerial mindsets will increase the level of their independence from public support systems that SFSCs tend to have and promote the long term persistence of SFSCs (Knickel et al. 2008).

In spite of their usefulness, the reader should be aware that the results discussed in this paper, as well as the methods used, are not free from limitations. At least two caveats should be kept in mind. First, the cross-sectional nature of the data and the type of estimation technique adopted does not allow for causal inference but is meant to be an exploration of the relationship between the presence of farmers' markets and adult Italians' BMI. Even though the potential endogeneity of FMs' location decisions should be appropriately taken into account to have unbiased estimates (Berning 2012; Salois 2012), the data available did not allow for such a refinement of the results. Thus, even though we controlled for potential confounding factors (i.e. consumption of fruit and vegetables) as well as other unobservables (regional fixed-effects), our results indicate only that a relationship exists between FMs' presence and lower BMIs among the adult Italian population, and no claims of causality can be made. Second, the fact that the level of detail of the FM data is regional means we can only measure the average impact of these variables across the population of a region. Although using quantile regression and the interaction of the FMD variable with the access indicators may capture the relationship between FMs and adult BMI at a more minute level, our data does not allow us to observe where consumers actually purchase their food, and the inferences we can make are, therefore, limited.

References

Atella, V., N. Pace, and D. Vuri. 2008. Are employers discriminating with respect to weight? European Evidence using Quantile Regression. *Economics and Human Biology* 6:305–329.

Banterle, A., and A. Cavaliere. 2009. Determinanti socio-economiche dell'obesità. *Agriregionieuropa* 5(19):7-9.

Baum, C.L., and C.J. Ruhm. 2009. Age, socioeconomic status and obesity growth. *Journal of Health Economics*, 28:635–648.

Berning, J.P. 2012. Access to local agriculture and weight outcomes. *Agricultural and Resource Economics Review* 41(1):1–15.

Bimbo, F., A. Bonanno, and G. Nardone. 2012. Food Access, eating habits and adult obesity in Italy. Paper presented at the Food Environment Symposium of the AAEA/EAAE Agricultural and Applied Economics Association, Boston, MA, May 2012.

Brown, A. 2002. Farmers' market research 1940–2000: An Inventory and Review. *American Journal of Alternative Agriculture* 17(4):167-76.

Brown, C. and S. Miller. 2008. The impacts of local markets: a review of research on farmers markets and community supported agriculture (CSA). *American Journal of Agricultural Economics* 90 (5):1298-1302.

Campagna Amica Foundation http://www.campagnamica.it/Pagine/default.aspx (accessed March 5, 2012).

Coldiretti 2009. Rapporto sugli acquisti dei prodotti alimentari direttamente dalle imprese agricole". Coldiretti News 951 (accessed October 19, 2009).

Coldiretti 2012. Vendita di vendita diretta: ecco i numeri di campagna amica (accessed February 24, 2012).

Cone, A.C., and A. Myhre. 2009. Community-Supported Agriculture: a sustainable alternative to industrial agriculture?. *Human Organization* 59(2):187-197.

Costa-Font, J., and J. Gil. 2008. What lies behind socio-economic inequalities in obesity in Spain? A decomposition approach. *Food Policy* 33: 61-73.

Courtemanche, C., and A. Carden. 2011. Supersizing supercenters? The impact of Walmart Supercenters on body mass index and obesity. *Journal of Urban Economics* 69:165-181.

Cummins, S., and S. Macintyre. 2006. Food environments and obesity - neighborhood or nation?. *International Journal of Epidemiology* 35:100–104.

Drewnowski, A. 2007. The real contribution of added sugars and fats to obesity. *Epidemiologic Reviews* 29:160–171.

Drewnowski, A., and N. Darmon. 2005.The economics of obesity: dietary energy density and energy cost. *American Journal of Clinical Nutrition* 82:265S–73S.

European Commission. EU Procurement Directives. 2004. http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32004L0018 (accessed January 12, 2015).

European Network for Rural Development (ENRD) 2012. Local food and short supply chains. EU Rural Review 12.

Frieden, T.R., W. Dietz, and J. Collins. 2010. Reducing childhood obesity through policy change: acting now to prevent obesity. *Health Affairs* 9:357-63.

Fry, J., and W. Finley. 2005. The prevalence and costs of obesity in the EU. *Proceedings of the Nutrition Society* 64:359–362.

Gale, F. 1997. Direct Farm Marketing as a Rural Development Tool. *Rural Development Perspectives* 12(2):19-25.

Gilg, A.W., and M. Battershill. 1998. Quality farm food in Europe: a possible alternative to the industrialized food market and to current agri-environmental policies: lessons from France. *Food Policy* 23(1): 25–40.

Govindasamy, R., J. Italia, M. Zurbriggen, and F. Hossain. 2002. Predicting Consumer Willingness-to-Purchase Value-Added Products at Direct Agricultural Markets. *Journal of Food Products Marketing* 8 (1):1-15.

Gregoire, M.B., S.W. Arendt, and C.H. Strohbehn. 2005. Iowa Producers' Perceived Benefits and Obstacles in Marketing to Local Restaurants and Institutional Foodservice Operations. *Journal of Extension* 43(1) http://www.joe.org/joe/2005february/rb1.php (accessed January 6, 2015).

Hammond, R.A., and R. Levine. 2010. The economic impact of obesity in the United States. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy* 3:285–295.

Hansstein, F., S. Capacci, and M. Mazzocchi. 2009. I numeri dell'obesità nelle regioni italiane. *Agriregionieuropa* 19: 6-7.

Hawkes, C., S. Friel, T. Lobstein, and T. Lang. 2012. Linking agricultural policies with obesity and non-communicable diseases: A new perspective for a globalizing world. *Food Policy* (37): 343–353.

Hunt, A. 2007. Consumer Interactions and Influences on Farmers' Market Vendors. *Agriculture and Food Systems* 22:54-66.

Ilbery, B., and D. Maye. 2005. Alternative (shorter) food supply chains and specialist livestock products in the Scottish and English border. *Environment and Planning* 37(5):823-844.

ISTAT - Noi Italia. 100 statistiche per comprendere il Paese in cui viviamo2009).

ISTAT - Retribuzioni contrattuali: dati congiunturali (2009).

ISTAT, 2009. Multipurpose Household Survey (Year 2009). Aspetti della vita quotidiana, http://www.istat.it/dati/catalogo/20090312_00/ (accessed March 12, 2009).

Italian Society of Nutrition – Società Italiana di Nutrizione http://www.sinu.it/html/pag/larn_annesso2.asp (accessed February 12, 2014).

Key, T.J., P.N. Appleby, and M.S. Rosell. 2006. Health effects of vegetarian and vegan diets. *Proceedings of Nutritional Society* 65(1): 35–41.

Kneafsey, M., L. Venn, U. Schmutz, B. Balázs, L. Trenchard, T. Eyden-Wood, E. Bos, G. Sutton, and M. Blackett. 2013. Short food supply chains and local food systems in the EU. A state of play of their socio-economic characteristics. European Commission Report.

Knickel, K., C. Zerger, G. Jahn, and H. Renting. 2008. Limiting and enabling factors of collective farmers' marketing initiatives: results of a comparative analysis of the situation and trends in 10 European countries. *Journal of Hunger & Environmental Nutrition* 3(2–3):247-269.

Koenker, R., and K.F. Hallock. 2001. Quantile regression. *Journal of Economic Perspective* 15(4):143–156.

Koenker, R.W., and G. Bassett. 1978. Regression quantiles. *Econometrica* 46 (1): 33–50.

La Trobe, H. 2001. Farmers' markets: consuming local rural produce. *International Journal of Consumer Studies* 25(3): 181–192

Lakdawalla, D., and T. Philipson. 2009. The growth of obesity and technological change. *Economics and Human Biology* 7(3): 283-293.

Larsen, K., and J. Gilliland. 2009. A farmers' market in a food desert: Evaluating impacts on the price and availability of healthy food. *Health & Place* 15(4):1158–1162.

Lazzarin, C., and C. Gardini. 2007. Vendita diretta, un business in crescita. *Informatore agrario* (1):5-11.

Loureiro, M.L., and R.M. Nayga. 2005. International dimensions of obesity and overweight related problems: an economics perspective. *American Journal of Agricultural Economics* 87(5):1147-1153.

Martinez, S., M. Hand, M. Da Pra, S. Pollack, K. Ralston, T. Smith, S. Vogel, S. Clark, L. Lohr, S. Low, and C. Newman. 2010. Local food systems: concepts, impacts, and issues in *USDA Economic Research Report 97*. Washington DC, US: USDA Economic Research Service.

Mazzocchi, M., and W.B. Traill. 2005. Nutrition, health and economic policies in Europe in *Food Economics* 2(3-4):138-149.

Moore, L.V., and A.V. Diez Roux. 2006. Associations of neighborhood characteristics with the location and type of food stores. *American Journal of Public Health* 96(2):325-331.

Pascucci, S., C. Cicatiello, S. Franco, B. Pancino, and D. Marino. 2011. Back to the future? Understanding change in food habits of farmers' market customers. *International Food and Agribusiness Management Review, International Food and Agribusiness Management Association* 14(4): 105-126.

Pieroni, L., and L. Salmasi. 2014. Fast-food consumption and body weight. Evidence from the UK. *Food Policy* 46:94-106.

Rolls, B.J., J.A. Ello-Martin, and B.C. Tohill. 2004. What Can Intervention Studies Tell Us about the Relationship between Fruit and Vegetable Consumption and Weight Management? *Nutrition Reviews* 62(1):1–17.

Salois, M.J. 2012. Obesity and diabetes, the built environment, and the 'local' food economy in the United States. *Economics & Human Biology* 10(1): 35–42.

Shipman, D. 2009. Setting the Stage: Local Foods Issues and Policies, presentation at Local Food Systems: Emerging Research and Policy Issues Conference at USDA, Economic Research Service, Washington, DC, June.

Traill, B.W. 2012. Presidential Address: Economic Perspectives on Nutrition Policy Evaluation. *Journal of Agricultural Economics* 63(3):505–527.

Tropp, D., and J. Barham. 2008. National Famers Market Summit Proceedings Report. USDA, Agricultural Marketing Service. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5066926 (accessed January 12, 2015).

Villar, J.G., and C. Quintana-Domeque. 2009. Income and body mass index in Europe. *Economics & Human Biology* 7(1): 73–83.

White, M. 2007. Food access and obesity. *Obesity Reviews* 8(1):99–107.

World Health Organization (WHO). 2004. Global strategy on Diet, Physical activity and Health, WHO Eighth plenary meeting.

World Health Organization (WHO). 2007. The challenge of obesity in the WHO European Region and the strategies for response.

Appendix

Table 3. Equation 1: OLS and quantile regression estimated parameters.

	OLS		Quantile Regression: Quantiles										Coef. equality test	
			0.10		**0.25**		**0.50**		**0.75**		**0.90**		$F_{(4, 21312)}$	Prob>F
FMD*ACC^{NH}	-0.263	***	-0.102		-0.205	**	-0.199	*	-0.436	***	-0.533	***	1.670	0.154
	(0.095)		(0.113)		(0.092)		(0.115)		(0.132)		(0.199)			
FMD*ACC^{SH}	-0.168		-0.104		-0.124		-0.117		-0.286	**	-0.359	*	0.600	0.665
	(0.103)		(0.116)		(0.104)		(0.126)		(0.144)		(0.215)			
FMD*ACC^{CH}	-0.390	***	-0.192		-0.297	**	-0.279	*	-0.518	***	-0.652	**	0.990	0.411
	(0.125)		(0.145)		(0.143)		(0.156)		(0.185)		(0.257)			
FVport	-0.049	***	-0.007		-0.010		-0.030	*	-0.056	**	-0.160	***	4.900	0.001
	(0.017)		(0.020)		(0.016)		(0.017)		(0.025)		(0.033)			
House size	0.093	***	0.039	*	0.036		0.071	***	0.077	**	0.180	***	2.100	0.079
	(0.022)		(0.022)		(0.022)		(0.027)		(0.030)		(0.052)			
Age	0.238	***	0.178	***	0.200	***	0.225	***	0.255	***	0.302	***	9.160	0.000
	(0.009)		(0.011)		(0.008)		(0.009)		(0.013)		(0.022)			
Age^2	-0.002	***	-0.001	***	-0.002	***	-0.002	***	-0.002	***	-0.002	***	5.270	0.000
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)			
Female	-1.974	***	-2.452	***	-2.486	***	-2.234	***	-1.790	***	-1.379	***	23.950	0.000
	(0.049)		(0.061)		(0.049)		(0.058)		(0.080)		(0.126)			
Educ. Years	-0.099	***	-0.057	***	-0.076	***	-0.102	***	-0.126	***	-0.126	***	10.770	0.000
	(0.006)		(0.007)		(0.007)		(0.008)		(0.010)		(0.014)			
Married	-0.144	**	0.066		0.018		-0.021		-0.161	*	-0.481	***	4.000	0.003
	(0.058)		(0.069)		(0.058)		(0.072)		(0.088)		(0.129)			
Smoke	-0.446	***	-0.400	***	-0.463	***	-0.335	***	-0.322	***	-0.535	***	2.410	0.047
	(0.056)		(0.068)		(0.060)		(0.067)		(0.078)		(0.122)			
Sport	-0.521	***	-0.072		-0.218	***	-0.433	***	-0.728	***	-1.130	***	15.870	0.000
	(0.063)		(0.066)		(0.054)		(0.063)		(0.079)		(0.133)			
TV Hrs	0.110	***	0.019		0.051	***	0.092	***	0.168	***	0.205	***	8.880	0.000
	(0.015)		(0.020)		(0.014)		(0.018)		(0.022)		(0.035)			
Income	-0.148	**	0.020		0.007		-0.031		-0.109		-0.326	**	0.980	0.415
	(0.069)		(0.081)		(0.069)		(0.083)		(0.110)		(0.160)			
Constant	20.623	***	18.081	***	19.063	***	20.206	***	22.089	***	23.729	***	19.570	0.000
	(0.298)		(0.319)		(0.275)		(0.296)		(0.449)		(0.649)			
Adj. R2	0.179		0.149		0.149		0.117		0.086		0.073			

Note. *, ** and ***, are 10, 5, and 1% significance levels – Bootstrapped standard errors in parenthesis. Region-level fixed-effects omitted for brevity.

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

Sustainability and Strategy in U.S. Agri-Food Firms: An Assessment of Current Practices

R. Brent Ross[Ⓘa], Vivek Pandey[b], and Kara L. Ross[c]

[a] *Assistant Professor, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 317B, East Lansing, Michigan, 48824, USA*

[b] *Assistant Professor, Institute of Rural Management Anand, IRMA Campus, Faculty Room 211, Anand, Gujarat, 388001, India*

[c] *Research Assistant Professor, Department of Agricultural Economics, Kansas State University, 306 Waters Hall, Manhattan, Kansas, 66506, USA*

Abstract

Increasingly, many major U.S. agri-food firms are joining their European counterparts in incorporating sustainability initiatives into their business operations. This paper provides a content analysis of the sustainability initiatives reported by select U.S. agri-food firms throughout the supply chain in their corporate social responsibility (CSR) reports. Among the results of our analysis, we find that many U.S agri-food firms continue to engage in a "hodgepodge" approach to sustainability without a clear link to their business strategy. Furthermore, these firms have transitioned their sustainability initiatives to focus on internal initiatives to address environmental and supply chain issues over time.

Keywords: sustainability, corporate social responsibility, firm strategy, value chain, content analysis

Ⓘ Corresponding author: Tel: + 1.517.355.2266
Email: R. B. Ross: rross@msu.edu
V. Pandey: vivek@irma.ac.in
K. L. Ross: kross02@ksu.edu

Introduction

Increasingly, many major U.S. agri-food firms are joining their European counterparts in incorporating sustainability initiatives into their overall global supply chains. Individual initiatives may take many different forms ranging from waste reduction and energy conservation to charitable donations and corporate governance. These initiatives, however, are generally included in a firm's operations as part of a larger portfolio of corporate social responsibility activities. As an emerging business function in agri-food firms, sustainability[1] "addresses how companies manage their economic, social, and environmental impacts, as well as their relationships in all key spheres of influence: the workplace, the marketplace, the supply chain, the community, and the public policy realm" (Harvard Kennedy School 2008).

The motivations, challenges and initiatives of U.S. agri-food firms to engage in this new business function continue to change rapidly. As noted by Rankin et al. (2011), agri-food companies are motivated to adopt such strategic efforts for numerous reasons, ranging from responding to internal and external pressures to achieve cost savings and waste reduction to self-fulfillment. However, a survey of top management executives indicated that risk management and brand protection objectives are viewed as the key reasons for adopting sustainability initiatives (McKinsey & Company 2009). Specific initiatives that may be implemented to meet these objectives include the following: preempting the threat of mandatory regulations, shaping future regulations, securing technical assistance and/or financial subsidies that lower the cost of abatement of emissions, and developing better relations with stakeholders, including governments, customers and investors (Khanna 2001). Under these scenarios, firms implicitly conduct a cost-benefit analysis which weighs the costs of implementing various sustainability initiatives with the penalties of unfavorable regulations, environmental damage remediation, and food safety recalls or the benefits from premium pricing. In contrast to these strategies, U.S. agri-food companies may also view sustainability initiatives as an opportunity to create a competitive advantage through value chain innovation or by creating 'shared value' (Ortitzky, Siegel and Waldman 2011, Porter and Kramer 2006).

The purpose of this paper is to review the corporate social responsibility (CSR) strategies of select U.S. companies in various sectors of the agri-food supply chain. We provide an assessment of the sustainability initiatives implemented by these companies using the growing CSR-performance literature to frame potential motives and common approaches. Our assessment uses frequency of adoption of practices to identify what appear to be general trends and from which strong hypotheses for testing can be developed. Throughout the paper, we also provide explicit examples of different types of agri-food sustainability initiatives. Furthermore, we suggest potential managerial implications of these initiatives for company and supply chain performance.

[1]The term "sustainability" is often used interchangeably with corporate social responsibility, corporate responsibility, corporate citizenship, social enterprise, sustainable development, triple-bottom line, corporate ethics, and in some cases corporate governance (Harvard Kennedy School 2008).

The rest of the paper is organized into four sections. First, some of the drivers behind the implementation of sustainability initiatives are presented and discussed. These drivers include both supply-side and demand-side competitive pressures as well as non-market ethical orientations of organizational leaders. The second section provides a review of the literature on CSR with a particular focus on the strategic uses of sustainability initiatives and their effect on firm performance. In the third section, a content analysis of the sustainability initiatives adopted by U.S. agri-food firms at two time periods is presented. To support this analysis, this section also highlights several initiatives to provide specific examples of the types of initiatives that have been implemented by these firms in their supply chains. The content analysis utilizes information included in the sustainability reports published by fourteen leading agri-food firms, consisting of two firms in each of the following sectors: retail (Walmart, Kroger), food service (McDonalds, Starbucks), food manufacturing (ConAgra, Kraft), beverage manufacturing (Coca-Cola, PepsiCo), livestock processing (Smithfield, Tyson), first handler/agricultural processing (Cargill, Archer Daniels Midland), and input supply (Monsanto, Deere) sectors. Finally, we offer directions for future research in this area. In particular, we aim to assess the challenges of estimating costs and benefits for participants and the difficulties associated with identifying their locations and effects in the supply chain. The paper argues that the success and endurance of agri-food supply chains that purport to pursue sustainability objectives may depend critically on the distribution of the associated costs and benefits of implementing those objectives. Where these costs and benefits of sustainability initiatives are perceived to be unfairly distributed, supply chain problems such as opportunism and moral hazard may arise. This paper calls on supply chain leaders to give careful consideration to the distribution of net benefits across the chain to ensure these problems are minimized.

Drivers of Sustainability Initiatives

Food companies face several incentives to engage in sustainability initiatives, which include both a growing pressure to respond to various stakeholder groups (Freeman 2010) and a desire to exploit the link between CSR and competitive advantage (Ambec and Lanoie 2008, Porter and Kramer 2006, Porter and Van der Linde 1995). In the former case, the rapid adoption of information technology, social media, and globalization have each increased the ability of special interest groups to promote their interests and to hold firms accountable in the public domain. As such, these groups have been increasingly active in exercising their authority to grant a "freedom to operate"[2] to agri-food companies (Shaw et al. 2010). Furthermore, their approval (or disapproval) of company activities has become a significant factor in the determination of the reputation and brand values of such companies. For companies whose value is largely tied up in the value of their brand[3], managing the interests of stakeholder groups and responding to their demands for environmentally-friendly production processes and socially acceptable management practices has become a high priority. According to a survey of corporate financial officers and investment professionals, maintaining a good corporate reputation and/or brand equity is the number one way sustainability programs can improve a company's financial performance (McKinsey & Company 2009).

[2] "Freedom to operate" or "license to operate" is a common term in the sustainability literature to describe the growing power of stakeholders and special interest groups to limit a firm's ability to operate (or sell products).
[3] Upwards of 60% of the value of many food companies is attributable to their brand (Sporleder and Louiso 2004)

Companies also recognize that there are also both supply-side and demand-side drivers for implementing sustainability initiatives. On the supply-side, the introduction of "green" practices is seen as both an important source of immediate and long-term cost savings and a differentiating factor in the marketplace (Hauschildt and Schulze-Ehlers 2014). In a report by Pulse Canada (2009), the top 50 food companies' the most cited initiatives were those that reduce energy and water usage, as well as packaging, and transportation resources. These reduction goals have the dual advantage of reducing resource usage and environmental impact and significantly reducing the costs of inputs and marketing. Ambec and Lanoie (2008) note that these gains contribute to the attractiveness of the product and promote market access opportunities. Far less prevalent initiatives have been sustainability initiatives focused on the "people" dimension or on the social environment (Pfeffer 2010, Bitsch 2010). These types of initiatives may provide an untapped opportunity for U.S. agri-food companies.

Food companies are also responding to the increasing consumer demand for sustainably produced products. According to a Natural Marketing Institute (2009) consumer segmentation study, LOHAS (Lifestyles of Health and Sustainability) consumers make up 17% of the U.S. general population. These consumers are those that are active stewards of the environment and are willing to pay a premium for green and socially responsible products. In a similar study, 54% of shoppers considered sustainability to be one of their decision-making factors and are "Leaning Green" (Bearse et al. 2009). Furthermore, "green" characteristics were found to be more important for consumable products such as food than for durable merchandise (Bearse et al. 2009). A consequence of this increased demand for sustainably produced products has been the growth of green or social advertising, and the practice of "greenwashing" (Bazillier et al. 2013). Greenwashing occurs when firms actively mislead consumers regarding their environmental practices or the environmental benefits of their product or service. Consumers have thus become increasing skeptical of green claims and Furlow (2010) has postulated that even firm's with legitimate sustainability initiatives will lose any competitive edge they might have gained because of this consumer skepticism. Some companies have even taken steps to withhold their positive environmental initiatives (Zmuda and Parekh 2008).

Another important driver of sustainability initiatives has been corporate leadership's belief in the "rightness" of embarking on sustainability initiatives. A case in point is Coca-Cola Corporation's CEO, Muktar Kent, who bills himself as Chief Sustainability Officer. On the appointment of an executive responsible for sustainability: "I have not appointed another one and never will. That's me." (Shapiro 2010). Similar sentiments have been seen in many other organizations, where a senior executive has believed so strongly in the strategy as to persuade the whole company to come along. This belief is not frequently misplaced because it is couched within the context of helping the company profitably enhance its market share and secure its competitiveness.

Sustainability Initiatives and Firm Performance

Given the incentives to adopt sustainability initiatives, there has been significant scholarly interest in studying the effect of sustainability initiatives on firm performance. In general, the sustainability-performance literature can be broadly categorized into short and long run research studies. Short-run research studies have mostly employed the event study methodology. The idea here has been to estimate stock market reactions to sustainability related events. In the finance and management literature, many studies have analyzed the impact of events that signal a firm's level of sustainability, such as environmental performance (Jacobs, Singhal, and Subramaniam 2010), food safety performance (Mazzocchi, Ragona, and Fritz 2009, Thomsen and McKenzie 2001, Wang, Qiu, and Kong 2011), organizational performance (Eccles, Ioannou, and Serafeim 2013, Hubbard 2009), and addition or deletion from a reputed sustainability index (Cheung 2010, Detre and Gunderson 2011).

Negative sustainability performance such as product recall, fines and violations, were found to have a severe adverse impact on the financial performance of concerned firms (Thomsen and McKenzie 2001, Henson and Mazzocchi 2002). On the other hand, positive performance was found not to result in positive gains (Detre and Gunderson 2011, Jacobs, Singhal, and Subramaniam 2010). In fact, Detre and Gunderson (2011) found that the share value of publicly traded U.S. agribusiness firms reacts negatively when the announcement is made that the firm is added to the Dow Jones Sustainability Index. Sustainability managers, however, are reminded that short-term analyses of sustainability and performance only capture the immediate impacts of negative or positive events. Such studies often fail to account for the complete sustainability-performance picture. In particular, they fail to capture how firm's organizational capabilities adjust to these initiatives over the long-term. One can argue that firms with strong sustainability performance have the ability to bounce back more quickly from sustainability related risks. For example, firms that are able to efficiently trace food safety issues back to their source are more likely to minimize food recalls. Such firm specific attributes as resilience, responsiveness, supply chain traceability and other organizational capabilities that result from sustainability initiatives are not typically included in short-term studies. Furthermore, since the short-run studies rely on investors (via stock markets) to measure the financial performance of companies, they neglect the performance responses from other significant stakeholders like consumers, government, societal organizations and knowledge institutions that may be able to interpret information about corporate social responsibility more accurately (Orlitzky 2013). Long-run studies, therefore, become necessary to allow for a full adjustment process that reflects both changes in organizational capabilities and effects on multiple stakeholders.

Long-run studies are often richer than short-run studies[4]with respect to the choice of variables concerning financial and sustainability performance. In the long-run corporate sustainability-financial performance literature, much attention has been paid to the relationship between the implementation of sustainability initiatives and economic performance, focusing primarily on the assumed cost and benefit tradeoff of adopting "green" practices (De Bakker, Groenewegen, and Den Hond 2005, Siegel and Vitaliano 2007, Orlitzky, Schmidt, and Rynes 2003, Moore 2001, Klein and Dawar 2004, McWilliams and Siegel 2000, McGuire, Sundgren, and Schneeweis 1988, Luo and Bhattacharya 2006, Orlitzky 2001, Ambec and Lanoie 2008, Hart and Ahuja 1996, Carter 2005, Klassen and McLaughlin 1996, Goll and Rasheed 2004, Stanwick and

[4] Long-run studies often look at annual financial and sustainability performance indicators, while short-run studies primarily analyze daily stock returns to capture response of investors to CSR related events.

Stanwick 1998). In their meta-analysis of CSR-financial performance studies across multiple industries and contexts, Orlitzky et al. (2003) found a significant positive correlation between CSR and financial performance though the effect size was small (mean observed correlation = 0.18). In a similar study, Peloza (2009) found that out of 128 studies that examined the CSR-financial performance relationship, 59% found a positive relationship, 27% a mixed or neutral relationship, and 14% a negative relationship. Studies specific to the agriculture and food sector are limited. One exception is a study of corporate social and financial performance in the UK Supermarket Industry, in which the authors observed a negative relationship between these two performance variables (Moore 2001). However, it should be noted that this study was limited to eight firms and the results were only descriptive in nature.

Given these long-term results, management scholars have come to view sustainability as a potential source of competitive advantage for those firms that choose to adopt such initiatives (Ambec and Lanoie 2008, Porter and Kramer 2006, Porter and van der Linde 1995). In their work, Ambec and Lanoie (2008) highlight seven ways in which sustainability initiatives can increase corporate performance (Figure 1). They argue that expanding market access and reducing raw material and capital costs may improve firm performance. The firm may also benefit from lower energy costs even as they build better relationships with their external stakeholders. This positions stakeholders to become advocates for the company and the company is able to benefit from the stakeholders' network to expand their markets (Freeman 2010). Most importantly, the potential benefits of strategic sustainability efforts are often amplified across performance variables over time (Ambec and Lanoie 2008).

Figure 1. Positive Links between Environmental and Economic Performance
Source. Reproduced from Ambec and Lanoie, 2008 (Figure 1).

Overview of Sustainability Initiatives in U.S. Agri-Food Firms

According to a Pulse Canada report (2009), over 80% of the top 50 food companies have made a public commitment to sustainability with many of those same companies having created an office of CSR within their organizations. To meet these commitments, food and agribusiness companies have initiated various sustainability programs, both independently and collectively with other food companies, non-government organizations and regional governments. Although many of these initiatives focus on resource and cost reduction programs, criteria for participating in the supply chain, and charitable donations, other initiatives have used sustainability initiatives to capture competitive advantage through innovation (Genier, Stamp, and Pfitzer 2008, Porter and Kramer 2006). These latter initiatives tend to focus on establishing alliances with supply chain partners to share information and risk, while aligning supply chain activities to meet sustainability objectives.

In this section, we provide a brief overview of the CSR strategies of select U.S. firms across various sectors of the agri-food supply chain. For this purpose we conduct summative content analysis. This type of content analysis is a widely used qualitative research technique and is particularly useful to generate meaningful insights and identify general trends with respect to the unit of analysis (Hsieh and Shannon 2005). Our analysis further classifies and codes sustainability initiatives according to seven categories of initiatives that were deducted from the analysis. These initiatives[5] are broken down by the sustainability category that they address: 1) environment, 2) food safety, 3) sourcing and supply chain relationships, 4) corporate governance, 5) labor, 6) sustainable products and practices, and 7) community development. A description of each sustainability category is provided in Table 2. Furthermore, we also classify each initiative by type of program: a) internal activities such as goal setting, technology adoption, promotion programs, and restructuring; b) standard and code programs; c) community or charitable donation programs; d) product innovations; and e) value chain innovation programs, including stakeholder partnerships.

The data for this study were collected from the CSR reports of fourteen selected U.S. agri-food firms at various stages of the supply chain during two time-periods: 2007-09 and 2009-11. Only the latest CSR report in each period was used. Within the sample, it is common practice not to publish CSR reports every year. The firms selected for this study include agri-food firms in the following sectors: retail (Walmart and Kroger), beverage manufacturing and distribution (Coca-Cola and PepsiCo), meat processing (Tyson and Smithfield), agro-processing (Archer Daniels Midland and Cargill), food service (McDonalds, Starbucks), food manufacturing (ConAgra, Kraft) and input supply (Monsanto, Deere & Company). Table 1 provides a description of each of the selected companies. These companies were selected on the basis of the size of their operations (i.e., market capitalization) and their experience with designing and implementing sustainability programs and initiatives. They do not represent an exhaustive set of leading sustainable agri-food companies. Given that sustainability is an emerging business function, there is also little consensus among stakeholder groups regarding the meaning and usage of sustainability-related terminology. For this reason, the use of qualitative data analysis software and/or algorithmic-based word searches would be problematic; instead the CSR reports were

[5]An expanded list of company initiatives can be obtained through request to the corresponding author.

manually coded and analyzed. The limited sample size in this study is a constraint and precludes further statistical analysis. This approach is common in qualitative review studies such as the one presented here (Hsieh and Shannon 2005).

Table 1. Sustainability reporting categories in global reporting initiative

Category of Sustainability Initiatives	Category Related Programs
Environment	Waste reduction, water conservation, energy conservation, emission reduction, renewable energy, environmental stewardship, land conservation
Food Safety	Food Safety
Sourcing & Supply Chain Relationship	Vendor standards, responsible sourcing, supplier benefits, supply chain relationships
Corporate Governance	Corporate Governance
Labor	Diversity, employee safety, employee benefits
Sustainable Products/services	Wellness, animal welfare
Community Development	Community projects, donations

Table 2. Description of selected agri-food companies (2012 values).

Firm	SIC	Market Value (USD Millions)	Sales (USD Millions)	Employees (Thousands)	Profitability (ROA)	Brand Value** (USD Millions)
Kroger	5411	13,329	90,374	339	0.03	-
Walmart	5411	209,728	444,948	2,200	0.08	36,220
McDonalds***	5812	102,477	27,006	420	0.17	35,593
Starbucks***	5812	27,774	11,700	149	0.17	3,663
Kraft	2000	66,049	54,366	126	0.04	4,644
ConAgra***	2000	10,251	13,263	26	0.11	3,115
PepsiCo***	2080	103,771	66,504	297	0.09	14,590
Coca Cola***	2080	158,342	46,565	146	0.11	71,861
Smithfield***	2011	3,299	13,094	46	0.05	-
Tyson***	2011	6,420	32,266	115	0.07	-
Cargill*	2046					
ADM	2070	20,381	80,676	31	0.05	-
Monsanto***	100	36,898	11,822	26	0.08	-
John Deere	3523	30,821	31,629	61	0.06	3,651

Sources. Compustat (North America, Annual) and Brand Finance, http://brandirectory.com/league_tables/table/global-500-2012. *Cargill in a privately-held company, financial data is not available. ** blanks indicate companies not listed in the Top 500 Brands by Brand Finance in 2012. *** Company's latest CSR report follows GRI Sustainability Reporting Guidelines.

Company Sustainability Initiatives by Category

Table 2 provides a description of the categories that were identified by the content analysis. These categories are consistent with the guidelines of the Global Reporting Initiative (GRI) and sustainability indices such as the Dow Jones Sustainability Index and KLD-DLS400. We describe each of these important initiatives and indices in further detail below.

Global Reporting Initiative (GRI)

The Global Reporting Initiative (GRI) is a "network-based organization that produces a comprehensive sustainability reporting framework that is widely used around the world." (The Coca-Cola Company 2011). GRI defines sustainability reporting as the practice of measuring, disclosing, and being accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development. (Global Reporting Initiative 2013) Sustainability reports that are prepared following the guidelines of the GRI reporting framework disclose the outcomes and results that occurred within the reporting period in the context of organization's commitments, strategy, and management approach to sustainability initiatives. The most recent version of the reporting framework, GRI-3.1, was launched in March 2011 and claims to be the most comprehensive sustainability reporting guidance available today (Global Reporting Initiative 2013).

The GRI-3.1 guidelines have two broad sustainability components: general initiatives and sector-specific initiatives. For example, the GRI launched specific sustainability reporting guidelines for the food processing sector, which include sourcing and animal welfare, percentage of work time lost due to industrial disputes, production of healthy and affordable food, among others.

As of the 2010 reporting year, 180 U.S. organizations had issued GRI reports, a 28% increase from the previous year (Global Reporting Initiative 2013). Based on the most recently available sustainability reports, all the agri-food firms in this study except Kraft, Deere, Cargill and ADM utilize the GRI framework. Table 3 uses the seven GRI-3.1 sustainability categories mentioned above to present the number of sustainability initiatives found in each of the fourteen CSR reports of the selected agri-food companies (See appendix for Table 3).

Sustainability Indices

Following the growing acceptance of socially responsible investing (SRI) within corporate and investment communities, several sustainability indices have been launched (Fowler and Hope 2007). These indices are used to signal to investors the performance of companies on a variety of environmental, social, and economic issues. Among the most widely used sustainability indices include the Domini Social 400 (DS400) and the Dow Jones Sustainability Index (DJSI); both assess the sustainability performance of large firms based on their market value.

The DS400 was the world's first sustainability index and launched in 1990. This index integrates environmental, social and governance (ESG) factors in its rating of the sustainability performance of companies included in the largest 3,000 U.S. equities. It uses the following seven key issue areas to evaluate companies: (1) community relations (charitable giving, support of

education, etc.); (2) corporate governance (compensation, ownership, transparency, etc.); (3) diversity (employment of disabled, women and minority contracting, etc.); (4) employee relations (health and safety, employee involvement etc.); (5) environment (clean energy, recycling, management systems, etc.); (6) human rights (labor rights, relation with natives, etc.); and (7) product (quality, innovations, etc.)

The DJSI, which was launched in 1999, has adopted a positive screening approach to construct its index. The index includes a subset of Dow Jones-listed companies that score highest on a comprehensive list of sustainability criteria. The DJSI's assessment is based on three distinct sections covering (1) economic (corporate governance, code of conduct, customer relationship management, risk management, etc.); (2) environment (reporting, performance and management systems); and (3) social (philanthropy, labor practices, talent attraction, supplier standards, etc.) management practices (RobecoSAM 2014). Table 4 provides membership information for the selected fourteen agri-food industries on these two indices during the years, 2009-2011.

Table 4. Membership in sustainability indices by selected agri-food firms (2009-2011).

	2009		**2010**		**2011**	
Firm	DJSI	DS400	DJSI	DS400	DJSI	DS400
Kroger						
Walmart						
McDonald's	✓	✓	✓	✓	✓	✓
Starbucks	✓	✓	✓	✓	✓	✓
Kraft	✓	✓	✓	✓	✓	✓
ConAgra					✓	
PepsiCo	✓	✓	✓	✓	✓	✓
Coca Cola	✓		✓			
Smithfield						
Tyson						
ADM						
Cargill						
Monsanto						
John Deere		✓		✓		✓

Note. ✓Indicates membership in the Sustainability Index

Company Sustainability Initiatives by Type

In this section, we provide a brief review of different types of sustainability initiatives and provide examples of each type of sustainability initiative from the selected agri-food firms. This section serves as an important link between the data generated through the content analysis and actual sustainability practices. The specific examples provided for each of the different types of initiatives are used to establish the validity of results that are discussed in the next section.

Table 5. Sustainability initiatives reported in the CSR reports of selected agri-food firms by initiative type (2009-11).

Firm	Internal Activities	Codes and Standards	Community Support and Donations	Product Innovation		Other	Total
Kroger	13	6	4	3	5	0	31
Walmart	5	0	2	1	5	0	13
Starbucks	4	1	1	1	6	3	16
MacDonald's	11	2	3	5	1	1	23
Kraft	13	4	1	8	5	2	33
ConAgra	15	1	1	5	0	3	25
PepsiCo	9	0	0	3	4	1	17
Coca Cola	7	2	1	2	4	1	17
Smithfield	10	0	2	0	0	3	15
Tyson	10	0	2	1	5	0	18
Cargill	8	2	4	1	3	4	22
ADM	17	1	3	0	0	1	22
Monsanto	4	2	2	4	0	1	13
John Deere	8	0	3	0	1	1	13
Total	**134**	**21**	**29**	**34**	**39**	**21**	**278**

Internal Resource and Cost Reduction Programs

All companies report programs to reduce natural resource consumption and minimize environmental impact from their operating functions. This finding is consistent with a 2009 Pulse Canada report of sustainability initiatives adopted by the top 50 food companies. The initiatives reviewed in this study generally fall into four categories: 1) waste reduction, 2) water conservation, 3) energy conservation and 4) emission reduction. Energy conservation initiatives are particularly prevalent throughout the upstream supply chain and waste reduction more prevalent with downstream players. To achieve these objectives, most companies rely on the adoption of new technology. It is also worthwhile to note that for the companies in this study, performance evaluation appears to be most extensive for these types of initiatives. Examples of the types of initiatives that were included as internal resources and cost reduction programs are as follows:

- Cargill – 100% of all Cargill-owned sows at company facilities will be moved from individual pens to group housing by the end of 2015, and all U.S. contract farms raising Cargill-owned sows will convert to group housing by the end of 2017 (Cargill 2014).
- Kroger – divert 70% of waste away from landfills and incinerators across 2,600 stores by 2015 (Kroger 2014).
- John Deere – established 2018 Eco-Efficiency Goals including: reduce energy consumptions and greenhouse gas emissions by 15% per ton of production; reduce water consumption by 15% per ton of production; and recycle 75% of total waste (Deere & Company 2014).

Standards and Codes

The standard and codes approach has been widely used throughout the agri-food supply chain and is typically implemented by downstream players to provide incentives for upstream players to adopt specific management practices. These incentives may take one of two forms; price premiums and/or exclusion/restriction of non-compliant suppliers from the supply chain. In this way, standards and codes tend to serve to redistribute the risks of sustainability initiatives and impose greater costs on upstream supply chain partners. Thus, Genier et al. (2008) have described this approach as a defensive approach to sustainability. Standards and codes are typically implemented through audits, certification and training programs.

In general, the criteria for various standards and codes programs cover four specific sets of management practices: environmental, labor and social conditions, economic viability, and food safety management practices. Furthermore, the set of standards and codes implemented by food companies maybe proprietary as in the case of the Rainforest Alliance's Certification program, utilize government regulations such as Walmart's Global Sourcing Initiative, or they maybe a result of collective industry action (e.g. SAI Platform, Roundtable on Sustainable Palm Oil, etc.). Genier et al. (2008) provides a review of various standards and codes programs (See appendix for Table 6). Of note, there are few programs that are comprehensive and fully cover the full multi-dimensionality of the sustainability construct.

In addition to the standards and codes programs mentioned above, below are examples of such programs that are used or have been initiated by U.S. agri-food firms as indicated in their CSR reports:

- Starbucks – "In 2008 we set a goal that all of our coffee would meet out standards for ethical sourcing by 2015, through C.A.F.E. Practices, Fairtrade and/or other externally verified or certified programs…since 2005 we have worked with the Ethical Tea Partnership to collaborate with others in the tea industry, and to make sure that our tea is grown in a socially responsible way" (Starbucks 2014: 5-6)

Charitable Donations

Agri-food companies commonly reported donations to charities and community organizations as sustainability initiatives as well. These donations may take many forms, including the donation of money and food. Furthermore, related activities such as fundraising and volunteerism were also included in this type of sustainability initiative. Specific examples of this type of sustainability initiative are as follows:

- Archer Daniel Midland – "Among our most notable contributions and developments [are]: the ADM Institute for the Prevention of Postharvest Loss at the University of Illinois, founded with a US$10 million ADM Cares grant, [which] continues to work with smallholder farmers in the developing world to help preserve some of the millions of metric tons of grains and oilseeds lost each year to disease, pests and handing." (Archer Daniel Midland 2013: 2)

- ConAgra – created the Child Hunger Ends Here® campaign that invites consumers to take action by entering codes found on specially marked packages. For every code found

on specially marked ConAgra Foods and P&G products and entered at childhungerendshere.com or facebook.com/childhungerendshere from March-September 2014, ConAgra or P&G will donate the monetary equivalent of a meal up to a maximum of seven million meals to Feed America (ConAgra 2014: 65).

Product Innovations

Agri-food companies also report product innovations as part of their sustainability initiatives. These innovations include reformulating products or adding new product attributes that increase the environmental friendliness or social acceptance of the product. In some cases, these innovations may be a form of "greenwashing" (Delmas and Burbano 2011). An example of a sustainability initiative classified as a product innovation includes the following:

- The Coca-Cola Company – introduced more than 400 new beverage products, 100 of which [were] reduced-, low- or no-calorie, and [continue] to increase the number of smaller size offerings…[and] innovate new sweeteners. In 2013, [the Coca-Cola Company] worked with [their] partner PureCircle to attain "Generally Recognized as Safe status in the U.S. for Rebaudioside M, or "Reb-M," a new stevia sweetener (The Coca-Cola Company 2014: 11-12)

Value Chain Innovations

- The final approach that agri-food companies have taken with regards to sustainability has been to set up formal strategic partnerships with their supply chain partners. These partnerships often include provisions to share both the benefits and costs of sustainability initiatives across the agri-food supply chain (Genier, Stamp, and Pfitzer 2008). In many cases, these types of initiatives take the form of downstream stream partners providing expertise and training as well as sharing market knowledge with upstream partners in return for a supply of sustainably produced inputs. This approach encourages learning on the part of both parties and creates opportunities for innovation and competitive advantage through the identification and measurement of value chain activities (Porter and Kramer 2006). Below is a description of a value chain innovation that a U.S. agri-food company has implemented as part of its sustainability initiatives.

- The Coca-Cola Company – created an initiative to distribute products through Manual Distribution Centers (MDC). These centers are micro distribution businesses that take advantage of the ability of Coca-Cola products to be distributed in a variety of formats. As part of this sustainability initiative, MDCs identify and engage independent entrepreneurs, many of whom are women, to distribute and sell Coca-Cola products in small, specific geographical areas where traditional delivery by trucks is not feasible and easily accessible. By using this distribution method, Coca-Cola is able to secure hard-to-reach markets while creating wealth and job growth in those areas. To date, there are 3,200 MDCs in Africa and these MDCs employ more than 19,000 people in local communities to distribute the Coca-Cola product, often by pushcart and bicycle (The Coca-Cola Company 2011). These MDCs have generated more than $950 million in revenues, primarily in high density urban areas throughout East Africa (The Coca-Cola Company 2011)

Collaborative Activities

Many agri-food companies also report different types of collaborative activities as part of their sustainability programs. These collaborative activities often take the form of working groups that consist of multiple agri-food stakeholders that engage to address a single, often wicked, problem such as sustainability (Dentoni, Hospes, and Ross 2012, Dentoni and Ross 2013). For example, Tyson Laboratory Services Group reports it has partnered with government, academia, trade associations, and other industry members to sponsor food safety research (Tyson 2007). To further foster food safety research and advancements, Tyson has committed to openly share this research and technology developments with their peers and colleagues. Among others, U.S. agri-food firms participate in the following multi-stakeholder engagement initiatives: the Sustainability Consortium, the Sustainable Food Laboratory, and Food Marketing Institute's Sustainability Summit. See Dentoni and Peterson (2011) for an extended discussion on multi-stakeholder engagements in the agri-food system.

Agri-food firms have also utilized direct collaborations with other firms across the agri-food chain to pursue their sustainability objectives. PepsiCo has partnered with leading academic institutions to develop healthier products for consumers (PepsiCo 2008). Cargill and McDonalds have created a partnership called Safe Supply of Affordable Food Everywhere (SSAFE) that focuses on fostering relationships between intergovernmental agencies and private industry (Cargill 2007). Their first initiative under this partnership was to address the threat of the virulent H5N1 strain of avian influenza on the poultry industry and human health. Moving beyond the traditional supplier audits and monitoring programs, Walmart and Coca Cola have developed training programs to assist their suppliers in acquiring the skills and good manufacturing practices that they need to efficiently and effectively manage their product and operating facilities (The Coca-Cola Company 2011, Walmart 2009).

Results and Discussion

Tables 3 and 5 provide a brief summary of the categories and types of the key sustainability initiatives that have been reported in recent CSR reports for the selected U.S. agri-food companies. There are several interesting features that result from this analysis. First, for the most part, the primary attention of these select agri-food companies has been directed towards environment concerns such as pollution-reduction, resource minimization, etc. (Table 3: 89 out of 282 reported initiatives across fourteen firms). Most of the environmental initiatives are directly tied to cost cutting, risk management, and regulatory compliance. Initiatives related to sourcing and supply chain relationships as well as employee issues (compensation, work environment and diversity) are also widely implemented (Table 3: 52 sourcing and supply chain initiatives and 48 labor related initiatives). Less prevalent have been initiatives directed towards corporate governance (3), food safety (21), and new products and wellness (29). It is interesting to note, however, that each company participates in at least four of the focus categories (Table 5), while most have implemented programs in five or more categories. It is also evident that many of the selected agri-food companies have relied heavily on internal resource and cost reduction activities to meet, at least in part, their sustainability objectives (Table 5: 134 out of 278 initiatives were internal resource and cost reduction activities).

An analysis of the sustainability initiatives of U.S. agri-food firms further reveals that the categories and types of initiatives can vary significantly between downstream firms (i.e. retailers and food service providers) and upstream players (i.e. input suppliers and agricultural processors). These differences are related to the specific sustainability issues faced by agri-food firms at different stages of the value chain. For instance, agricultural processing firms in the sample (Archer Daniels Midland and Cargill) have used overseas sourcing of raw materials in order to cut costs (Table 3: 12 initiatives). This has lead to sustainability problems such as deforestation, habitat under-conservation, and labor mistreatment. Beverage manufacturers face sustainability problems related to the perceived overuse of ground water resources in developing markets (Table 3: Coca Cola and Pepsi share seventeen environmental initiatives). The disposal of food and non-food waste, employee safety, and energy consumption in stores are significant sustainability problems faced by retailers.

As a result, the categories and types of sustainability initiatives reported by U.S. agri-food firms are typically aligned with their unique sector issues. With respect to environment-related initiatives, retailers and food service providers are more likely to focus attention on recycling, reducing or reusing packaging, constructing LEED certified buildings, and reducing (store) energy usage. The focus of the environmental efforts of agricultural processing firms includes reducing the greenhouse gas emissions, increasing use of renewable energy, fresh water conservation and reduction in volatile organic compounds (i.e., VOCs). Input suppliers have very similar environmental programs to agricultural processors, but place additional emphasis on land conservation. Differences can also be observed in relation to the sustainable products/wellness practices implemented by firms across the agri-food supply chain. Food manufacturers report product innovations aimed at reducing undesirable content in food (e.g., cholesterol, sugar and sodium) and enhancing desirable nutrients (e.g., whole grains). Agricultural processor and input suppliers, on the other hand, typically report process innovations related to issues such as the labeling of genetically modified foods (i.e., traceability programs) and access to safe and nutritious food.

The direct supply chain linkages between agri-food firms also influence the types of sustainability initiatives adopted. Since agricultural and livestock processing firms typically procure inputs from many independent suppliers, supply contracts with codes and standards have been used to implement sustainability initiatives in relation to animal welfare and labor standards. In some cases, processors and beverage manufacturers have provided credit facilities to their suppliers for reducing risk related to production and to ensure a consistent supply of quality-specific product. Retailers and food service providers, on the other hand, procure inputs primarily from large agribusiness and food manufacturing firms. Audits, supplier training and the collection of data on key performance indicators at supplier facilities are often used in these sectors to influence the sustainability orientation of their suppliers. Retailers and food service providers have also used various types of incentive schemes to influence the buying behavior of consumers. For example, consumers are given discounts if they bring reusable bags instead of using plastic bags. Food manufacturers have policies in relation to advertising certain products to children.

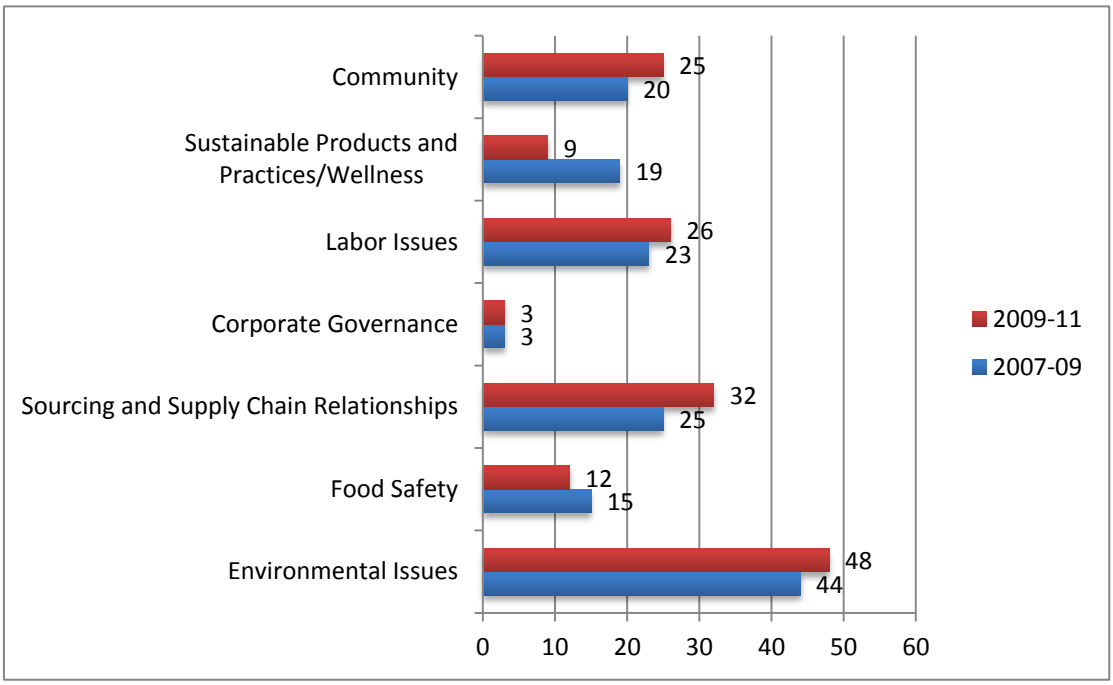


Figure 2. Comparison of sustainability initiatives reported by selected agri-food firms by category*:2007-09 vs 2009-11.

Note. Includes data from Kroger, Walmart, PepsiCo, The Coca-Cola Company, Tyson Foods, Smithfield, Cargill, and Archer Daniels Midland

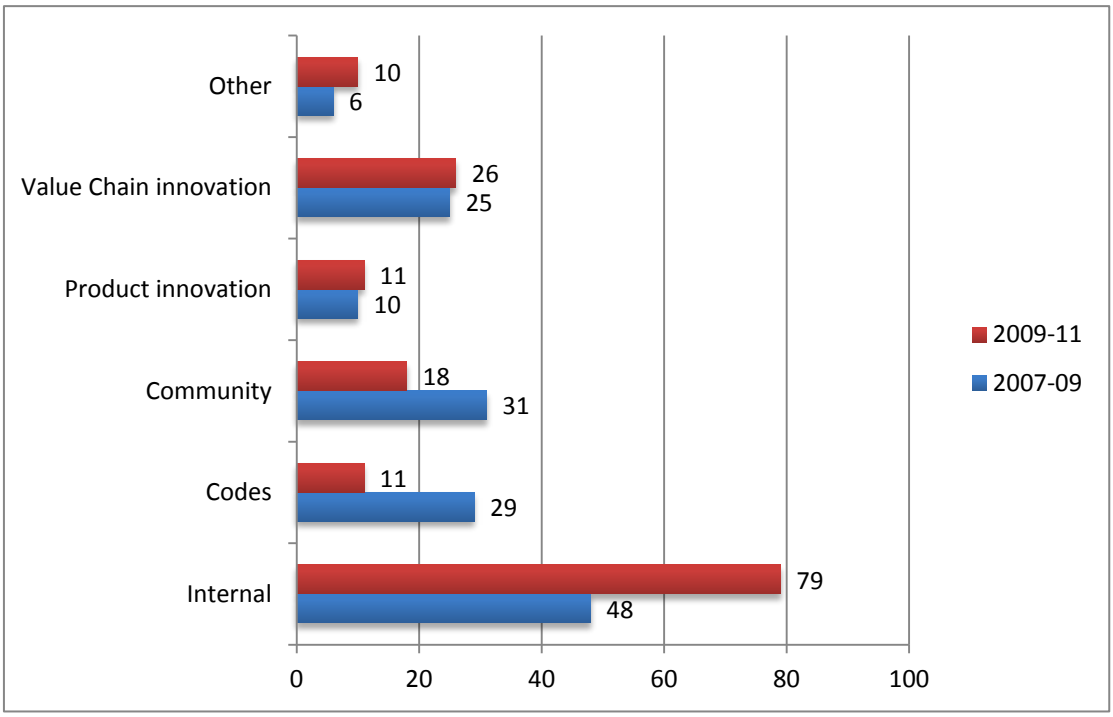


Figure 3. Comparison of sustainability initiatives reported by selected agri-food firms by type*:2007-09 vs 2009-11.

Note. Includes data from Kroger, Walmart, PepsiCo, The Coca-Cola Company, Tyson Foods, Smithfield, Cargill, and Archer Daniels Midland

While the discussion above is based on the sustainability initiatives reported by U.S. agri-food companies at a point in time, the data collected for this study also allows for a comparative analysis of these initiatives over time. Here, we find that the number of initiatives implemented during two time periods, 2007-09 and 2009-11, have been relatively stable (152 vs. 155, respectively). However, our analysis finds that there has been a significant change in the composition of those initiatives over time. Since the 2007-09 reporting period, the number of initiatives have increased for the following categories: environmental issues (Figure 2: 44 vs. 48), sourcing and supply chain relationships (Figure 2: 25 vs. 32), labor issues (Figure 2: 23 vs. 26), and community support issues (Figure 2: 20 vs. 25), while focus on issues related to sustainable products and practices (including wellness) and food safety have decreased (Figure 2: 19 vs. 9). Changes have also occurred by the type of initiative. When compared to the 2007-09 period, there have been increases in the following types of initiatives in the 2009-11 time period: internal resource and cost reduction activities (Figure 3: 48 vs. 79), marginal increase in product innovation (Figure 3: 11 vs. 10), and value chain innovations (Figure 3: 25 vs. 26), and other (Figure 3: 6 vs. 10). These increases were offset during this time period by reductions in the number of codes and standards and community (including donations) initiatives (Figure 3: 29 vs. 11). Taken together, the changes in the categories and types of sustainability suggests that U.S. agri-food companies have reduced their reliance on initiatives that either try to mitigate risk through the communication of sustainability attributes (i.e. promotion of sustainable/wellness products and practices) and community donations or shift risk to upstream supply chain partners through the issue of codes and standards (i.e. food safety issues).

What remains unclear from these CSR reports is how these activities are linked to the corporate and business strategies of their respective companies. As a result, we cannot conclusively understand the drivers behind the change in CSR initiatives by category and type, as summarized in Tables 3 and 5 and Figures 2 and 3. Porter and Kramer (2006) indicate that the typical approach has been for companies to select sustainability initiatives in a 'hodgepodge' manner without consideration to the link to their company's competitive strategy. In other words, companies typically experiment with their sustainability initiatives, choosing to use a comprehensive approach to select their initiatives and the types of mechanisms they use to implement those initiatives. Although this approach may diversify away the risk associated with using one type of initiative, Porter and Kramer (2006) point out that such a disjointed and unfocused approach will often lead to companies that are unable to create (or reinforce) a competitive advantage from their sustainability activities. Ultimately, Porter and Kramer (2006) argue that the decision whether to implement these initiatives becomes a strict cost-benefit analysis with distinct trade-offs for firm performance. When this occurs, sustainability initiatives often become viewed as a necessary cost of doing business (i.e., license to operate, reputation protection) rather than win-win scenarios.

This 'hodgepodge' approach appears to be consistent with the programs that many of the selected U.S. agri-food companies CSR programs have implemented. Furthermore, this approach suggests that these companies have taken a defensive position towards sustainability to protect their reputation and licenses to operate. This is in contrast to the strategic approach proposed by Porter and Kramer (2006) and later by Genier et al. (2008) and Ambec and Lanoie (2008) to use sustainability initiatives as a mechanism to build competitive advantage and create wealth. Table 3 provides information on the orientation of agri-food firms towards sustainability as a business strategy. It can be argued that negative correlation between strategies that are categorized as

'Codes and Standards' and 'Value Creating' strategies (e.g., value chain innovation and product innovation) can be interpreted as a 'focused' approach towards sustainability, while the positive coefficient would suggest a 'hodgepodge' approach. In the small sample size of fourteen companies, the estimated correlation coefficient between code and standards and value creating strategies is 0.58 (significant at 1% confidence level). Although this finding indicates that U.S. agri-foods may used a 'hodgepodge' approach to sustainability initiative selection, we do not claim this result to be conclusive and suggest further research is needed to determine the link with firm strategy.

Another observation relates to the level at which the sustainability initiatives are implemented. As Epstein (2008) reports, successful sustainability programs are those that require a systemic search and implementation of sustainability activities. These types of activities would include supply chain initiatives where there is the potential to create 'shared value' among the chain partners (Porter and Kramer 2006). Judging from the selected company portfolios (see Table 5, in Appendix), there appears to be a lack of these types of initiatives with shared value potential. Instead the focus for many of the companies appears to be on initiatives that are implemented internally.

Most notably absent from most of these portfolios are activities directed to food safety; one area where systemic (i.e. supply chain) initiatives are likely to be most needed and where shared value is most likely to be created. One exception is Tyson (2010) which began pursuing Global Food Safety Initiative (GFSI) certification. GFSI is a partnership between food safety experts from retailer, manufacturer, and food service companies that focus on continual improvement of food safety management systems. Environmental issues could also be considered for supply chain initiatives; however, internal waste and cost reduction programs and the use of codes and standards seem to be the dominant approach here and it is unlikely requirement-type mechanisms will lead to anything other than the redistribution of risks and costs. Certainly, the creation of shared value solely through codes and standards seems unlikely.

Bell and Morse (2008) propose that measuring sustainability is an important step in successful sustainability programs and that a careful, systematic approach is needed for measuring sustainability indicators that focus on the social impact. This measurement approach is support by Porter and Kramer (2006) who suggest that many companies do not measure or report the outcomes of their activities but rather the time and effort they have put into the program (e.g., number of initiatives, voluntary hours, dollars spent, etc.). The focus on time and effort appears to be consistent with the CSR reports examined here. One exception appears to be ConAgra who have placed a strong emphasis on measuring performance in all the departments. They have set up robust systems to collect data internally, have set goals for 2015 and also report where they stand at the present time in accomplishing those goals (ConAgra 2011).

More appropriate sustainability metrics and measurement tools are needed throughout the industry to allow managers to create the business case for sustainability and to drive innovation in the sector (Hubbard 2009; Porter, et al. 2012). As Ernst & Young (2012) reports, metrics (e.g., ratings and rankings) bring key sustainability issues to the attention of corporate executives. Return on investment (i.e., ROI) predictions for sustainability projects can be used to make the business case to support investment allocation decisions. One such example of an initiative to develop sustainability metrics and tools is "The Sustainability Consortium" that was formed in

2009 under the leadership of Walmart. This multi-stakeholder engagement process has completed sustainability profiles for fifteen food, beverage and agriculture product categories (The Sustainability Consortium 2013). These profiles consist of a dossier of scientific knowledge about the product category and a hotspot analysis, a category sustainable profile (CSP) including a synthesis of product knowledge and sustainable improvement opportunities, and key performance indicators to measure and track performance. The goal of these profiles is to give category managers a means to quantify the returns to sustainability investments and to make the business case for sustainable innovation within their companies (see http://www.sustainabilityconsortium.org/ for further details).

The measurement and evaluation of sustainability initiatives is difficult. One specific challenge is how to define the unit of analysis, that is, a sustainability initiative. Based on our analysis of sustainability reports, how initiatives are evaluated is a significant challenge due to the lack of uniformity between each initiative. In addition to the types and categories identified above, initiatives also vary by:

(1) The dimensionality of the initiative. Most environmental efforts tend to have a uni-directional effect (e.g., waste reduction, water and air conservation programs), many supply chain related initiatives have multi-directional effects. For instance, Coca Cola's investments in MDCs have helped women in East Africa to augment their income (social dimension) as well as increased the market access to Coca Cola products (economic dimension).

(2) The geographic scope of the initiative. The costs and effort required to implement similar sustainability programs differs from region to region. Returns for each sustainability dimension are also likely to vary significantly between locations. Any study evaluating sustainability efforts must accommodate inter-regional differences.

(3) The reach of the sustainability program. There is significant variation in the operations level at which sustainability programs are implemented. Our analysis finds sustainability initiatives that are aimed at plant level operations (i.e., new technologies to reduce energy usage in a store), others at the regional level (i.e., water conservation), while others were aimed at global operations (i.e., global sourcing).

Questions, therefore, arise as to the appropriateness of treating each initiative equally, or whether more value should be placed on certain initiatives. Our analysis would suggest that the type of sustainability initiative that is implemented matters. Sustainability indices that rely on counts of sustainability initiatives or binary rating scales when used to measure corporate sustainability performance must therefore be used with caution. Future research should explore the mechanisms by which different initiatives create sustainability impact and how this impact differs by type of initiative (Aguinis and Glavas 2012). The Walmart Sustainability Index appears to be a step in this direction.

Finally, many of the sustainability initiatives described above require the participation and coordination of multiple supply chain players along the food supply chain to be successful. How this coordination is organized is a distinguishable feature of these programs and maybe a source of competitive advantage for agri-food companies. As detailed above, a dominant type of

initiative used by agri-food firms is to impose requirements on supply chain partners through standards and codes in contractual arrangements. In many cases, these requirements have the effect of shifting the costs and risks of the initiatives to less powerful supply chain players. Given the significant downstream consolidation of the agri-food sector, this typically means that risks and costs are shifted up the chain to those players that are least likely to be able to deal with these changes. These initiatives can have unintended sustainability consequences including the exclusion of smallholders from the supply chain, and incentives for suppliers to misrepresent their capabilities to meet sustainability standards and codes required to enter (or remain in) the supply chain[6]. A third consequence is the potential for under investment in capital and labor resources by suppliers that have already entered into contracts to provide sustainably produced inputs. If monitoring costs are high or monitoring is ineffective, then it may be advantageous for a supplier to under invest in new technologies aimed to improve food quality in order to mitigate the additional costs imposed on them by the sustainability initiative.

Conclusion

This paper provides an overview of the sustainability initiatives implemented by fourteen leading U.S. agri-food firms at various stages of the agri-food value chain. It also highlights relevant literature in the area of agri-food sustainability with particular reference to the sustainability-performance relationship. The results of our study indicate that the characteristics of the sustainability initiatives implemented by U.S. agri-food firms vary by supply chain sector and time.

The findings presented in this paper have several implications for agri-food managers and future research with respect to the effect of sustainability initiatives on firm performance and the sustainability of the agri-food system. Foremost, however, is that the results imply that the attributes of the sustainability initiative matter. The adoption of specific sustainability initiatives is context-dependent; particular types and categories of sustainability initiatives may be more appropriate for certain firms and not for others. For the sustainability manager of an agri-food firm, this might suggest that the decision-making processes needed to determine whether to adopt sustainable practices is more complex than determining how many resources to allocate to sustainability or how many practices to adopt. Furthermore, allocating resources equally across various initiatives (i.e., the hodgepodge approach) may secure the firm's license to operate, but it is unlikely to create value of the firm and enhance firm performance. The selection of sustainability initiatives should be purposeful and align with the context (e.g., supply chain position, location, etc.) in which the firm finds itself as well as with the overall strategy of the firm. Attention should also be paid to the implications for firm performance and the governance of the firm's agri-food supply chain that result from different sustainability initiatives. Internal activities such as implementing new operational procedures to reduce waste in a plant are likely to be more measureable, easier to evaluate, and easily captured by the firm. At the same time, the value created by this initiative may be limited to the firm with little positive spillover effect for the sustainability of the agri-food system as a whole. Value chain innovations, on the other hand, have the potential to have a greater impact on the sustainability of the agri-food system, but

[6] The cost of not misrepresenting capabilities (i.e., lost premiums, penalties, exclusion from the supply chain, etc.) may be greater than the risks of getting caught.

come at the cost of a greater need for value chain coordination and a potential reduction in the ability to capture returns from initiatives. The solution to this latter tradeoff is to adopt innovations that align the incentives of participants in the value chain by creating shared value (Porter and Kramer 2006 2011), and thereby, distributing the costs and benefits of innovations across the supply chain.

The findings of this study also imply that counts of initiatives are not likely to be adequate measures of the sustainability performance of a firm. If the performance (e.g., financial, environmental or social) effects of individual sustainability initiatives are not equal, studies or indices that use count data or binary rating scales in order to evaluate the sustainability performance of firms will not fully capture the nature of a firm's sustainability portfolio or its impact on firm or societal performance. Furthermore, if the effects of sustainability initiatives vary across firms by industry sectors, geographic location, etc., then it may not be appropriate to compare firms by sustainability performance without taking those differences into consideration. Future research is warranted in this area.

While this study provides a systematic review of sustainability initiatives adopted by some leading U.S. agri-food firms, we do not make the assertion that these results are generalizable to the sustainability initiatives adopted by agri-food firms outside the fourteen firms analyzed herein. Consistent with Aguinis and Glavas (2012), the goal of this study was to instead provide a framework that might be used to gain a greater understanding of the complex nature of company sustainability portfolios and their link to firm strategy and outcomes. Additional research is needed to further examine the characteristics of sustainability initiatives adopted by U.S. agri-food firms and their effect on firm and supply chain performance.

Acknowledgement

The authors would like to thank Vincent Amanor-Boadu, the IFAMR editorial team, and two anonymous reviewers for their insightful comments on earlier versions of the manuscript. Any errors or omissions are the responsibility of the authors.

References

Ambec, S., and P. Lanoie. 2008. Does it pay to be green? A systematic overview. *The Academy of Management Perspectives* 22(4): 45-62.

Midland, A. D. 2009. Corporate Responsibility Overview 2009. http://www.adm.com/en-US/responsibility/2009CR/download/Pages/default.aspx. [Accessed May 2010].

_____. 2011. Corporate Responsibility Overview 2011. http://www.adm.com/en-US/responsibility/2011CR/Pages/downloads.aspx. [Accessed July 2012].

_____. 2013. 2013 Corporate Responsibility Report--Selected Highlights. http://www.adm.com/enUS/responsibility/2013CorporateResponsibilityReport/Pages/DownloadsArchive.aspx. [Accessed October 2014].

Bazillier, R., and J. Vauday. 2013. The Greenwashing Machine: Is CSR More Than Communication? CNRS Working Paper Series, Universite d' Orleans.

Bearse, S., P. Capozucca, L. Favret, and B. Lynch. 2009. Finding the Green in Today's Shoppers: Sustainability Trends and New Shopper Insights. Grocery Manufacturers Association and Deloitte. http://www.deloitte.com/view/en_LU/lu/library/whitepapers/sustainable-development/652c7d6ac7226210VgnVCM200000bb42f00aRCRD.htm. [Accessed January 2011].

Bell, S., and S. Morse. 2008. *Sustainability Indicators: Measuring the Immeasurable*. New York: Earthscan Publications Ltd.

Bitsch, V. 2010. Labor Aspects of Sustainability. Paper presented at the 20th Annual World Symposium of the International Food and Agribusiness Association, Boston, MA, June 19-22.

Cargill. 2007. Corporate Citizenship Review. http://www.cargill.com/wcm/groups/public/@ccom/documents/document/br-citizenship-review.pdf. [Accessed May 2010].

_____. 2009. Corporate Responsibility Report. http://www.cargill.com/wcm/groups/public/@ccom/documents/document/2009-annual-report.pdf [Accessed January 2011].

_____. 2014. 2014 Corporate Responsibility Report. http://www.cargill.com/wcm/groups/internal/@ccom/documents/document/na31674912.pdf. [Accessed October 2014].

Carter, C. R. 2005. Purchasing Social Responsibility and Firm Performance: The Key Mediating Roles of Organizational Learning and Supplier Performance. *International Journal of Physical Distribution & Logistics Management* 35(3):177-194.

Cheung, A.W.K. 2011. Do Stock Investors Value Corporate Sustainability? Evidence from an Event Study. *Journal of Business Ethics* 99:145-165.

ConAgra Foods. 2009. 2008 Corporate Responsibility Report. http://www.conagrafoodscitizenship.com/archived-reports. [Accessed July 2012].

_____. 2011. 2011 Corporate Responsibility Report. http://www.conagrafoodscitizenship.com/archived-reports. [Accessed July 2012].

_____. 2014. 2014 Citizenship Report. http://www.conagrafoodscitizenship.com/. [Accessed October 2014].

De Bakker, F. G. A., P. Groenewegen, and F. Den Hond. 2005. A Bibliometric Analysis of 30 Years of Research and Theory on Corporate Social Responsibility and Corporate Social Performance. *Business & Society* 44 (3):283-317.

Deere & Company. 2009. Citizenship Summary Report 2009-2010: Achieving Sustainable Performance. www.deere.com/en_US/docs/.../citizenship/2009_gcreport_en.pdf. [Accessed January 2011].

_____. 2011. Citizenship Summary Report: Achieving Sustainable Performance. https://www.deere.com/en_US/docs/.../citizenship/2011_gcreport_en.pdf. [Accessed February 2011].

_____. 2014. A Power For Good: 2014 Global Citizenship Report. http://www.deere.com/en_US/docs/html/brochures/publication.html?id=3295b168#1. [Accessed October 2014].

Delmas, M. A., and V. C. Burbano. 2011. The Drivers of Greenwashing. *California Management Review*.

Dentoni, D. and R. B. Ross. 2013. Towards a Theory of Managing Wicked Problems through Multistakeholder Engagements: Evidence from the Agribusiness Sector. *International Food and Agribusiness Management Review* 16(Special Issue A):1-10.

Dentoni, D., O. Hospes, and R. B. Ross. 2012. Managing Wicked Problems in Agribusiness: The Role of Multi-Stakeholder Engagements in Value Creation. *International Food and Agribusiness Management Review* 15(Special Issue B):1-12.

Dentoni, D. and H. C. Peterson. 2011. Multi-stakeholder Sustainability Alliances in Agri-Food Chains: A Framework for Multi-Disciplinary Research. *International Food and Agribusiness Review* 14(5):83-108.

Detre, J.D., and M.A. Gunderson. 2011. The Triple Bottom Line: What is the Impact on the Returns to Agribusiness?" *International Food and Agribusiness Management Review* 14(4):165-178.

Eccles, R. G., I. Ioannou, and G. Sarefeim. 2013. The Impact of Corporate Sustainability on Organizational Processes and Performance. Harvard Business School Working Paper, 12-35.

Ernst & Young. 2012. Six Growing Trends in Corporate Sustainability. http://www.ey.com/US/en/Services/Specialty-Services/Climate-Change-and-Sustainability-Services/Six-growing-trends-in-corporate-sustainability_overview. [Accessed September 2012].

Epstein, M. J. 2008. *Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental and Economic Impacts*. San Francisco: Berrett-Koehler Publishers.

Freeman, R. E. 2010. *Stakeholder Theory: The State of the Art*. Cambridge: Cambridge University Press.

Fowler, S.J., and C. Hope. 2007. A Critical Review of Sustainable Business Indices and their Impact. *Journal of Business Ethics* 76: 243-252.

Furlow, N. 2010. Greenwashing in the New Millenium. *Journal of Applied Business and Economics* 10(6): 22-25.

Genier, C., M. Stamp, and M. Pfitzer. 2008. Corporate Social Responsibility in the Agri-Food Sector: Harnessing Innovation for Sustainable Development. Report prepared for the Food & Agriculture Organization of the United Nations. FSG Social Impact Advisors. http://www.regoverningmarkets.org/en/resources/business/corporate_social_responsibility_in_the_agri_food_sector_harnessing_innovation_for_sustainable_development. [Accessed January 2011].

Global Reporting Initiative. 2013. Dive into the Information Hub. https://www.globalreporting.org/information/Pages/default.aspx. [Accessed April 2013].

Goll, I., and A. A Rasheed. 2004. The Moderating Effect of Environmental Munificence and Dynamism on the Relationship Between Discretionary Social Responsibility and Firm Performance. *Journal of Business Ethics* 49(1):41–54.

Hart, S. L., and G. Ahuja. 1996. Does It Pay to be Green? An Empirical Examination between Emission Reduction and Firm Performance. *Business Strategy and the Environment* 5(1): 30–37.

Harvard Kennedy School. 2008. Corporate Social Responsibility Initiative: Defining CSR. The President and Fellows of Harvard University. http://www.hks.harvard.edu/m-rcbg/CSRI/init_define.html. [Accessed May 2014].

Hauschildt, V., and B. Schulze-Ehlers. 2014. An Empirical Investigation into the Adoption of Green Procurement Practices in the German Food Service Industry. *International Food and Agribusiness Management Review* 17(3):1-32.

Henson, S., and M. Mazzocchi. 2002. Impact of Bovine Spongiform Encephalopathy on Agribusiness in the United Kingdom: Results of an Event Study of Equity Prices. American Journal of Agricultural Economics 84(2):370-386.

Hsieh, H-F., and S. E. Shannon. 2005. Three Approaches to Qualitative Content Analysis. *Qualitative Health Research* 15(9):1277-1288.

Hubbard, G. 2009. Measuring Organizational Performance: Beyond the Triple Bottom Line. *Business Strategy and the Environment* 18:177-191.

Jacobs, B., V. Singhal, and R. Subramanian. 2010. An Empirical Investigation of Environmental Performance and the Market Value of the Firm. *Journal of Operations Management* 28: 430-441.

Khanna, M. 2001. Non-mandatory Approaches to Environmental Protection. *Journal of Economic Surveys* 15 (3): 291-324.

Klassen, R. D, and C. P McLaughlin. 1996. The Impact of Environmental Management on Firm Performance. *Management Science* 42 (8): 1199-1214.

Klein, J., and N. Dawar. 2004. Corporate Social Responsibility and Consumers' Attributions and Brand Evaluations in a Product-harm Crisis. *International Journal of Research in Marketing* 21(3): 203-217.

Kraft Foods. 2010. Working to Build a Better World: Kraft Foods Responsibility Report.

_____. 2011. Our Progress in 2011: Creating a More Delicious World. http://global.mondelezinternational.com/SiteCollectionDocuments/pdf/KraftFoods_DeliciousWorld2011.pdf. [Accessed July 2012].

Luo, X., and C. B. Bhattacharya. 2006. Corporate Social Responsibility, Customer Satisfaction, and Market Value. *Journal of Marketing* 70(4): 1-18.

Mazzocchi, M., M. Ragona, and M. Fritz. 2009. Stock Market Response to Food Safety Regulations. *European Review of Agricultural Economics* 36(4): 571-595.

McDonald's. 2008. Worldwide Corporate Responsibility Report: Responsible Food for a Sustainable Future 2008. http://www.aboutmcdonalds.com/content/dam/AboutMcDonalds/Sustainability/Sustainability%20Library/mcd048_2008report_v5.pdf. [Accessed July 2012].

_____. 2011. McDonald's 2011 Global Sustainability Scorecard. http://www.aboutmcdonalds.com/content/dam/AboutMcDonalds/Sustainability/Sustainability%20Library/2011-Sustainability-Scorecard.pdf. [Accessed July 2012].

_____. 2013. 2012-2013 Corporate Responsbility & Sustainability Report. http://www.aboutmcdonalds.com/mcd/sustainability/sustainability_CR_reports.html. [Accessed October 2014].

McGuire, Jean B., Alison Sundgren, and Thomas Schneeweis. 1988. Corporate Social Responsibility and Firm Financial Performance. *The Academy of Management Journal* 31(4): 854–872.

McKinsey & Company. 2009. Valuing Corporate Social Responsibility. *McKinsey Quarterly*. https://www.mckinseyquarterly.com/Strategy/Valuing_corporate_social_responsibility_McKinsey_Global_Survey_Results_2309. [Accessed December 2010].

McWilliams, A., and D. Siegel. 2000. Corporate Social Responsibility and Financial Performance: Correlation or Misspecification? *Strategic Management Journal* 21(5): 603–609.

Monsanto. 2009. Grown for the Future: 2008-2009 Corporate Responsibility and Sustainability Report. http://www.monsanto.com/sitecollectiondocuments/2008-2009-csr-report.pdf. [Accessed July 2012].

Monsanto. 2011. Corporate Social Responsibility and Sustainability Report. http://www.monsanto.com/sitecollectiondocuments/csr_reports/2011-csr.pdf. [Accessed July 2012].

Moore, G. 2001. Corporate Social and Financial Performance: An Investigation in the UK Supermarket Industry. *Journal of Business Ethics* 34(3):299–315.

National Marketing Institute. 2009. LOHAS Consumers Around the World. National Marketing Institute. http://www.lohas.com/sites/default/files/lohasconsumers.pdf. [Accessed December 2010].

Orlitzky, M. 2001. Does Firm Size Confound the Relationship Between Corporate Social Performance and Firm Financial Performance? *Journal of Business Ethics* 33(2): 167–180.

Orlitzky, M., F. L Schmidt, and S. L Rynes. 2003. Corporate Social and Financial Performance: A Meta-analysis. *Organization Studies* 24 (3): 403–441.

Ortlitzky, M., D. S. Siegel, and D. A. Waldman. 2011. Strategic Corporate Social Responsibility and Environmental Sustainability. *Business & Society* 50(1): 6-27.

Orlitzky, M. 2013. Corporate Social Responsibility, Noise, and Stock Market Volatility. *Academy of Management Perspectives* 27(3): 238-254.

Peloza, J. 2009. The challenge of measuring financial impacts from investments in corporate social performance. *Journal of Management* 35: 1518-1541.

PepsiCo. 2008. Performance with Purpose: PepsiCo Corporate Citizenship Report 2008. http://www.pepsico.com/Assets/Download/PepsiCo_2008_Sustainability_Report.pdf. [Accessed January 2011].

_____. 2010. Performance with Purpose: Sustainability Summary 2010. http://www.pepsico.com/Assets/Download/PepsiCo_2010_Sustainability_Summary.pdf. [Accessed January 2011].

Pfeffer, J. 2010. Building Sustainable Organizations: The Human Factor. *Academy of Management Perspectives* 24(1): 34–45.

Porter, M. E, and C. Van der Linde. 1995. Toward a New Conception of the Environment-competitiveness Relationship. *The Journal of Economic Perspectives* 9(4): 97–118.

Porter, M. E., and M. R. Kramer. 2006. Strategy & Society: The Link Between Competitive Advantage and Corporate Social Responsibility. *Harvard Business Review* 84(1/2): 78–92.

———. 2011. Creating Shared Value. *Harvard Business Review* 89 (1/2): 62-77.

Porter, M. E., G. Hills, M. Pfitzer, S. Patscheke, and E. Hawkins. 2012. Measuring Shared Value: How to Unlock Value by Linking Social and Business Results. Foundation Strategy Group (FSG) Report. http://www.fsg.org/tabid/191/ArticleId/740/Default.aspx?srpush=true on. [Accessed January 2013].

Pulse Canada. 2009. Sustainability Trends of the Top 50 Food Producers. http://www.sustainablefoodlab.org. [Accessed February 2010].

RobecoSAM. 2014. Measuring Intangibles: RobecoSAM's Corporate Sustainability Assessment Methodology. http://www.sustainability-indices.com/images/Measuring_Intangibles_CSA_methodology_03_2014.pdf. [Accessed October 2014].

Rankin, A., A. W. Gray, M. D. Boehlje, and C. Alexander. 2011. Sustainability Strategies in U.S. Agribusiness: Understanding Key Drivers, Objectives and Actions. *International Food and Agribusiness Management Review* 14(4): 1-20.

Shapiro, A. L. 2010. Coca-Cola Goes Green. *Forbes.* http://www.forbes.com/2010/01/29/muhtar-kent-coca-cola-leadership-citizenship-sustainability.html. [Accessed February 2010].

Shaw, J., T. Dickinson, M. Schultz, M. Boehlje, A. Rankin, and B. Jones-Bliss. 2010. Building and Implementing a Sustainability Strategy. Center for Food and Agricultural Business (CAB CS 10.3), Purdue University.

Siegel, D. S, and D. F Vitaliano. 2007. An Empirical Analysis of the Strategic Use of Corporate Social Responsibility. *Journal of Economics & Management Strategy* 16(3): 773–792.

Smithfield. 2009. Corporate Social Responsibility Report 2008/09. http://www.smithfieldcommitments.com/wp-content/themes/smithfield/pdf/csr-reports/smi_csr_0809.pdf. [Accessed May 2010]

Smithfield. 2011. Corporate Social Responsibility Summary Report 2010/11. http://www.smithfieldcommitments.com/wp-content/themes/smithfield/pdf/csr-reports/smi_csr_11.pdf. [Accessed July 2012].

Sporleder, T. L, and J. C Louiso. 2004. Brand Equity in the Global Food System. Proceedings of the Sixth International Conference on Chain and Network Management in Agribusiness and the Food Industry. *Dynamics in Chains and Networks (Ede, 27-28 May 2004)*, 465.

Stanwick, P. A, and S. D Stanwick. 1998. The Relationship Between Corporate Social Performance, and Organizational Size, Financial Performance, and Environmental Performance: An Empirical Examination. *Journal of Business Ethics* 17(2): 195–204.

Starbucks. 2009. Starbucks Shared Planet: Global Responsibility Report 2009. http://globalassets.starbucks.com/assets/359fba8443174461b674acdec0885479.pdf. [Accessed May 2010].

_____. 2011. Starbucks Global Responsibility Report – Goals and Progress 2011. http://globalassets.starbucks.com/assets/19c68ea6c48a473d865c7327c08d817f.pdf. [Accessed July 2012].

_____. 2013. Starbucks Global Responsibility Report Goals and Progress 2013. http://www.starbucks.com/responsibility/global-report. [Accessed October 2014].

The Coca-Cola Company. 2008. 2007/2008 Sustainability Review. http://www.thecoca-colacompany.com/citizenship/pdf/2007-2008_sustainability_review.pdf. [Accessed May 2010].

_____. 2011. 2010/2011 Sustainability Report. http://www.thecoca-colacompany.com/sustainabilityreport/index.html. [Accessed July 2012].

_____. 2014. 2013/2014 Sustainability Report. http://assets.coca-colacompany.com/0a/b5/ece07f0142ce9ccc4504e28f1805/2013-2014-coca-cola-sustainability-report-pdf.pdf. [Accessed October 2014].

The Kroger Company. 2008. Doing Our Part: 2008 Sustainability Report. http://www.thekrogerco.com/documents/KrogerSustainReport08.pdf. [Accessed May 2010].

_____. 2011. Sustainability Improving Today to Protect Tomorrow: 2011 Sustainability Report. http://sustainability.kroger.com/KrogerSustainability2011.pdf. [Accessed July 2012].

_____. 2014. Improving Today to Protect Tomorrow: 2014 Sustainability Report. http://sustainability.kroger.com/1-Kroger_30043_CSR14.pdf. [Accessed October 2014].

The Sustainability Consortium. 2013. Food, Beverage, & Agriculture Sector Working Group. http://www.sustainabilityconsortium.org/fba/. [Accessed October 2013].

Thomson, M.R., and A.M. McKenzie. 2001. Market Incentives for Safe Foods: An Examination of Shareholder Losses from Meat and Poultry Recalls. *American Journal of Agricultural Economics* 82(3): 526-538.

Tyson Foods, Inc. 2007. 2007 Sustainability Report. http://www.tyson.com/Corporate/PressRoom/docs/SR2007.pdf [accessed May 2, 2010].

_____. 2010. 2010 Sustainability Report. http://www.tysonfoods.com/Sustainability/2010/Sustainability-At-Tyson-Foods.aspx [Accessed July 2012].

Walmart. 2008. Walmart Announces Global Responsible Sourcing Initiative at China Summit. http://walmartstores.com/pressroom/news/8696.aspx. [Accessed May 2, 2010].

_____. 2009. 2009 Global Sustainability Report. http://walmartstores.com/sites/sustainabilityreport/2009/. [Accessed May 2010].

_____. 2012. 2012 Global Sustainability Report. http://www.walmartstores.com/sites/responsibility-report/2012/. [Accessed July 2012].

_____. 2012. Walmart Announces New Commitments to Drive Sustainability Deeper into the Company's Global Supply Chain. http://news.walmart.com/news-archive/2012/10/25/walmart-announces-new-commitments-to-drive-sustainability-deeper-into-the-companys-global-supply-chain. [Accessed August 2013].

Wang, M., C. Qiu, and D. Kong. 2011. Corporate Social Responsibility, Investor Behaviors, and Stock Market Returns: Evidence from a Natural Experiment in China. *Journal of Business Ethics* 101: 127-141.

Zmuda, N. and R. Parekh. 2008. Why brands can't afford to be silent. *Advertising Age* 79(24).

Appendix

Table 3. Sustainability initiatives reported in the CSR reports of selected agri-food firms by category* (2009-11).

Table 3. Sustainability initiatives reported in the CSR reports of selected agri-food firms by category* (2009-11).

	Environment**	Food Safety**	Sourcing and Supply Chain**	Corporate Governance	Labor**	New Products and Wellness	Community	Total
Kroger	11	6	4	1	4	4	3	**33**
Walmart	4	0	4	0	3	0	2	**13**
PepsiCo	7	0	3	0	2	3	2	**17**
Coca Cola	10	0	3	0	1	1	2	**17**
Cargill	3	1	6	1	1	1	9	**22**
ADM	7	0	6	1	5	0	3	**22**
Smithfield	2	3	3	0	6	0	2	**16**
Tyson	4	5	3	0	4	0	2	**18**
Starbucks	8	0	4	0	1	0	3	**16**
McDonald's	4	0	6	0	3	8	2	**23**
Kraft	11	3	7	0	5	6	2	**34**
ConAgra	10	3	4	0	6	2	0	**25**
Monsanto	4	0	3	0	2	4	0	**13**
John Deere	4	0	0	0	5	0	4	**13**
Total	89	21	56	3	48	29	36	**282**

Notes. * Categories are consistent with the GRI. **indicates categories where there are significant laws and regulation

Table 6. Comparison of 14 independent standards and codes across the agri-food sector.

		Global GAP	Rainforest Alliance/SAN	SCS-001	Ethical Trading Initiative	Common Code for the Coffee Community	Marine Stewardship Council	Basel Criteria for Responsible Soy Production	Roundtable on Sustainable Palm Oil	SA8000	Fairtrade Standards	IDF/FAO Guide to Good Dairy Farming Practice	SAI Principles & Practice for Sustainable Production (Cereals)	EISA	Utz Certified
Environment	Ecosystems & Biodiversity	X	X	X		X	X	X	X		X		X	X	X
	Natural Resource Inputs	X	X	X		X		X	X		X		X		X
	Manmade Inputs	X	X	X		X		X			X		X		X
	Energy Use and GHG Emissions	X		X		X		X			X		X		X
	Waste Management	X	X	X			X	X	X		X	X	X	X	X
	Production Practices	X	X	X			X	X	X		X	X	X	X	X
Labor Conditions	Occupational Health & Safety	X	X	X	X	X		X	X	X	X		X	X	X
	Terms of Employment		X	X	X	X		X	X	X	X		X	X	X
	Human Rights in the Workplace		X	X	X	X		X	X	X	X		X		X
	General Employee/Family Welfare		X	X	X	X				X	X		X	X	X
Local Economic /Community Benefits	Producers' Economic Viability			X				X	X				X		
	Flow of Economic Benefits		X	X				X			X		X	X	
	Social/Economic Rights of Others		X	X		X	X	X	X						
	Business Ethics					X		X	X						
	Education & Role Modeling								X					X	
Food Safety and Quality	Traceability	X	X	X		X		X					X		X
	Hygienic Production & Handling	X	X	X				X				X	X	X	X
	Quality of Inputs	X						X				X	X		X
	Quality of Management Systems	X	X	X		X					X				X

Source. Reproduced from Genier et al. 2008 (Table 1).

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

Social Capital, Member Participation, and Cooperative Performance: Evidence from China's Zhejiang

Qiao Liang[ⓘa], Zuhui Huang[b], Haiyang Lu[c] and Xinxin Wang[d]

[a]*Assistant Professor, China Academy for Rural Development, School of Management, Zhejiang University, Yuhangtang Road 866, Qizhen Building 1207, Zijingang Campus, Zhejiang University, Hangzhou, 310058, China*

[b]*Professor, China Academy for Rural Development, Zhejiang University, Yuhangtang Road 866, Qizhen Building 1212, Zijingang Campus, Zhejiang University, Hangzhou, 310058, China*

[c] *Doctor, Institute of Public Policy, South China University of Technology, China*

[d]*Assistant Professor, Zhejiang University of Finance and Economics*

Abstract

Despite the position of farmer cooperatives in markets and their social capital based characteristics, neither the definition nor the role of social capital in farmer cooperatives has been broadly investigated. Thus, this study seeks to develop a framework for defining and clarifying various aspects of social capital and examines the effects of social capital on members' participation in collective activities and on the economic performance of farmer cooperatives. Social capital is indicated in terms of three dimensions, i.e., the external, relational, and cognitive dimensions. A statistical model is applied to a database consisting of 147 farmer cooperatives in China's Zhejiang province. The results demonstrate a positive relationship between certain dimensions of social capital and members' participation in training and general meetings. In addition, each dimension of social capital has a significant and positive impact on the economic performance of cooperatives.

Keywords: farmer cooperative, social capital, member participation, economic performance, China

ⓘCorresponding author: Tel: +8613575736211
Email: Q. Liang.liangqiao2323@126.com
Z. Huang: zhhuang@zju.edu.cn
H. Lu: charlie_lu@zju.edu.cn
X. Wang: xxwang1985@gmail.com

Background

The changing structure of agricultural production, the specialization of supply chain participants, and the diversification of consumer demand have led to challenges for small farmers (Hazell et al. 2006). Farmer cooperatives have emerged to address market failures caused when these challenges become problems (LeVay 1983, Hansmann 1996, Valentinov 2007). However, cooperatives may not be sufficiently competitive in terms of financial capital and human capital compared with capitalistic firms due to the member patronage and member control features of the cooperative governance structures (Cook 1995, Lin and Ma 2006, Royer and Smith 2007, Tribl 2009). A governance structure specifies ownership rights, decision rights, and income rights over (both physical and financial) assets (Hansmann 1996). Cooperatives are defined as member-owned, member-controlled, and member-benefiting governance structures (Dunn 1988).

The ownership characteristics of cooperatives and the features of collective decision making make cooperative governance relatively 'expensive' in terms of transaction costs (Valentinov 2004). Unlike a market in which two actors are involved or investor-owned firms in which authority is held by a few investors, cooperatives are characterized by high involvement and interaction among all members in decision making and in the distribution of benefits. Therefore, interpersonal relations are the foundation upon which internal transactions are based. Social capital is a concept that addresses and facilitates cooperation, relationships, and trust (Beugelsdijk and van Schaik 2005). As Valentinov (2004, 5) posits, "cooperatives are a special, social capital-based, type of organization." Capital is collectively owned by all the members of the group. Social capital is more essential in cooperatives than in other types of governance structures. The role of social capital in cooperatives is comparable to that of physical or financial capital in investor-owned firms or that of human capital to the individual. Chloupkova et al. (2003), regard farmer cooperatives as a proxy of social capital, pinpointing the network component of social capital.

Social capital is increasingly recognized as an important factor influencing economic performance (Beugelsdijk and van Schaik 2005). Over the last two decades, many cooperatives have transformed from democratic organizations into more capitalistic- or economic-oriented organizations (Nilsson et al. 2012). The decline of social capital in cooperatives is understood as a reason for and a consequence of the transformation. As the size of organizations and member heterogeneity expand, cooperatives have become oriented more toward corporate governance (Hind 1997). Professional management has taken advantage of members' control in traditional cooperatives (Lang 2006). Members' commitments to their organizations – and the trust between members and managers – have been weakened (Hogeland 2006). Moreover, there is less communication, collaboration, and meaningful interaction among members (Nilsson et al. 2012). All these changes lead to the result that cooperatives have lost and are losing social capital (Nilsson et al. 2012).

Despite the position of farmer cooperatives in markets and awareness about their social capital-based characteristics, the definition and measurement of social capital in farmer cooperatives have not yet been broadly investigated, and there is little empirical evidence to support the concept in these organizations. Social capital has been widely investigated in corporate studies but not yet in studies of cooperatives (Cooke and Clifton 2004, Wu and Leung 2005, Westlund

2006, Zhang and Fung 2006, Lee 2009, Westlund and Adam 2010). Thus, this research seeks to formulate a framework for defining and clarifying the various aspects of social capital and to examine the effects of social capital on cooperative members' behaviors and on the performance of farmer cooperatives. To be specific, the research questions are as follows:

1. What is the composition of social capital in farmer cooperatives in China?
2. Does social capital influence members' participation in the collective activities of their cooperatives?
3. What are the impacts of social capital on the economic performance of cooperatives?

This study makes various contributions. First, we add to the literature regarding the composition, measurement, and role of social capital as it pertains to farmer cooperatives. Although there are a number of studies on the role of social capital in political contexts (Putnam 1993, Chloupkova et al. 2003) and in for-profit firms (Nahapiet and Ghoshal 1998, Tsai and Ghoshal 1998), little attention has been paid to the effects of social capital on the economic performance of farmer cooperatives. Due to the social capital-based nature of cooperatives, this issue seems even more important. Second, data from Chinese farmer cooperatives are used to explore the role of social capital. Both economic and political agents in China are characterized by the high involvement of "Guanxi" – which roughly translates as "relationship" – in conducting their activities (Putnam 1993). Due to the distinctive features regarding social capital in farmer cooperatives in China compared with those in Western countries, specific theories and measurements of social capital in Chinese cooperatives are desirable. However, there are few studies delineating social capital in Chinese farmer cooperatives. In addition, there are not yet any empirical studies regarding social capital in cooperatives that address subjects such as the effect of social capital on member participation and the performance of cooperatives.

The remainder of this paper is organized as follows: the theory and hypotheses for this study are formulated in the next section. This is followed by the chosen methodology and a summary of the data and results. This is followed by a discussion and conclusions.

Theory

Concept of Social Capital

Physical capital, human capital, and social capital are three basic inputs that generate productivity and economic benefits (Adler and Kwon 2002, Granovetter 2005). Physical capital, including financial assets, consists of the material resources used to improve flows of future income, whereas human capital refers to the knowledge and skills that individuals use to solve problems. Social capital is the arrangement of human resources to improve the flow of information to generate future income (Ostrom 1994).Social capital refers to "any features of social organization, such as networks, norms, and trust, that facilitate coordination and cooperation for mutual benefits" (Putman 1993). Although it benefits individuals, social capital is a community-level concept and a 'public good' (Uphoff and Wijayaratna 2000). In addition, social capital frequently increases the investment in physical and human capital (Coleman 1988, Putnam 1993). We therefore define social capital as the networks that facilitate interactions between individuals.

Social capital is studied mostly at the macro level, both at the national and regional levels, and the role of organizational level social capital has also been examined. Scores of studies by political economists and economic sociologists have emphasized social capital's importance in economic and social development. Based on an experiment in Italy, Putnam (1993) concludes that governmental performance and economic progress may be enhanced by social capital. Different levels of social capital may result in inequalities on the job market, in education, in gaining access to healthcare services, etc. Alternatively, Putnam (1993) also argues that deficits in social capital can lead to the decline of social activities and that the economic effects of social capital therefore can be as great as the effects of financial and human capital. He concludes that "social capital is not a substitute for effective public policy but rather a prerequisite for it and, in part, a consequence of it". In a later article, Putnam (1995) argues that a substantial stock of social capital facilitates coordination and communication, incentivizes future cooperation, and reduces opportunism. Chloupkova et al. (2003) compare the level and building of social capital in Denmark and Poland against the background of these countries' cooperative movements. Denmark had a significantly higher level of social capital in the 1990s. The communist system and centrally planned economies in Poland limited the development of entrepreneurship and various social organizations, which led to the destruction of social capital. Uphoff and Wijayaratna (2000) demonstrate the benefits of social capital with respect to the productivity of water irrigation systems in Sri Lanka. Social capital plays a role akin to 'organizational software', which makes the 'physical hardware' of irrigation facilities more productive.

The role of social capital in organizations has been investigated by a few studies. Nahapiet and Ghoshal (1998) find that social capital facilitates the creation and sharing of intellectual capital in firms and that the absence of social capital has negative effects. The high level of social capital may ossify cooperation and exchanges because the scope of ideas and information is restricted. The contributions of social capital to firm innovations (Tsai and Ghoshal 1998, Cooker et al. 2005) and the formation of human capital (Coleman 1988) are identified. Various aspects of social capital have inter-associations and impact firms' product innovation by facilitating resource exchange and resource combinations (Tsai and Ghoshal 1998). Cooker et al. (2005) demonstrate the performance of firms that have different levels of social capital in a database consisting of 455 small and medium-sized firms in different regions of the UK that enables the authors to find positive associations between social capital and firm performance in terms of innovation and business growth.

Social capital in farmer cooperatives is examined in several papers (Valentinov 2004, Luo and Wang 2013). Social capital in organizations is accumulated to fulfill aims in terms of maximizing owners' or members' interests (Westlund and Adam 2010). Capitalist enterprises are characterized by profit orientation, whereas cooperatives feature a high level of member involvement in decision making and high intra-organization coordination costs. Social capital is thus an important supplement to formal institutions and governance in cooperatives. Cooperatives are considered to have certain incentive problems and coordination difficulties whose solution requires social capital. Valentinov (2004) therefore argues that "social capital is best governed by the cooperative governance." Social capital acts as both organizational principle and resource in cooperatives. However, social capital benefits those cooperatives with relatively small memberships, in particular. Returns from financial and physical capital exceed those from social capital in larger cooperatives. Luo and Wang (2013) confirm the role of social

capital as an instrument for solving the collective action dilemma in Chinese farmer cooperatives. Social capital is essential in informal institutions that compensate the limited presence of laws and bylaws regarding farmer cooperatives.

Indicators of Social Capital

Social capital is complex and difficult to measure. Until now, social capital has not been measured directly and is frequently reduced to one or even a part of one of its indicators. At the macro-level, Chloupkova et al. (2003) use three indicators for social capital: membership in voluntary organizations, trust, and civic participation. Another popular indicator system regarding macro-level social capital is developed by Putnam (1993), in which networks, norms, and trust are the three indicators of social capital. Networks are referred to as social relationships. Many studies emphasize the network dimension of social capital and even equate networks to social capital. Norms specify what actions are acceptable or unacceptable (Lyon 2000), whereas trust is the confidence or belief in other agents that perseveres in spite of uncertainties, risks, and opportunisms (Misztal 1996).

Tsai and Ghoshal (1998) demonstrate the ingredient of social capital at the firm level and distinguish the following three dimensions of social capital: the structural dimension, the relational dimension, and the cognitive dimension. The structural dimension of social capital refers to the social networks or social interactions of a firm that can be used to access specific resources or facilitate transaction. The relational dimension of social capital is the trust and trustworthiness embedded in the organization or among its members. The cognitive dimension pertains to the shared vision that facilitates the understanding of collective orientation and ways of acting in an organization. This analysis of the three dimensions of social capital is used mostly in business and management studies (Lee 2009). In addition, there are associations among the different dimensions of social capital. Structural social capital may stimulate trust and trustworthiness, which represent the relational dimension of social capital (Tsai and Ghoshal 1998). The structural and relational dimensions of social capital can be conceptualized, respectively as inter-organizational trust and interpersonal trust within an organization (Zaheer et al. 1998). Moreover, a common understanding of the organization's goals and mission, which represents the cognitive dimension of social capital, may also help develop trust within the organization (Tsai and Ghoshal 1998).

We distinguish three dimensions of social capital based on Tsai and Ghoshal (1998) and by incorporating the feature of cooperatives. They are external dimension, relational dimension, and cognitive dimension of social capital. External social capital refers to inter-organizational networks that a cooperative is engaged, whereas both relational and cognitive dimensions are intra-organizational social capital. Relational social capital is the trust among members and between members and managers, while cognitive social capital indicates the collective orientation of members in a cooperative.

Different types of firms operate differently and may vary with respect to each dimension of social capital as well. However, according to our knowledge, there is no systematic theory regarding social capital for different types of firms. The embeddedness of cooperatives makes the external dimension of social capital more concerned with the local community and social

connections than investor-owned firms (IOFs), in addition to marketing and financial stakeholders (Xu 2005, Nilsson et al. 2012). Cooperatives, which are owned and controlled by their members, are characterized by dual types of attributes, an economic attribute and a social attribute, which makes them proxies for the formation and development of social capital (Nilsson and Hendrikse 2011). Internal social capital in cooperatives – the relational and cognitive dimensions of social capital –is an important resource in cooperatives (Nahapiet and Ghoshal 1998, Nilsson et al. 2012).However, IOFs maximize financial profits; thus, inter-trust among employees – and also between employees and shareholders – is subordinated to financial returns. Cooperatives require a high level of intra-organizational social capital to ensure the loyalty and commitment of members (Feng et al. 2011).

Social Capital in Chinese Farmer Cooperatives

Farmer cooperatives in China emerged in the 1980s and have developed quickly since that time. As of the end of 2013, there are almost one million farmer cooperatives, with a total membership of 73 million farmers. Approximately 28.5% of farmers join farmer cooperatives.[1] Cooperatives in China are facing transformations in terms of both internal governance and organization models. Some farmers have substantial capabilities in marketing and management and hold most income rights and decision rights in cooperatives, whereas most common members are seldom involved in decision making and have little power (Liang et al. forthcoming).

Social capital in farmer cooperatives in China has distinctive characteristics over those in Western countries. There are two dimensions of features. First, "Guanxi" is particularly important for political, social, and economic activities in Chinese society (Putnam 1993). Farmer cooperatives are not an exception. Considering the "Guanxi" culture in China, social relationships may play an even more important role in Chinese farmer cooperatives than in other countries. In fact, "Guanxi" is generally held by a few elite farmers rather than by common farmers (Xu et al. 2013). These elite farmers, referred to as core members, initiate farmer cooperatives and hold most of the authority over decision making in cooperatives (Liang and Hendrikse 2013). Core members have substantial capabilities regarding marketing, management, and/or social networks (Li and Zheng 2008, Xu et al. 2013, Liang et al., forthcoming). The social networks relevant to these core members are in close contact or have relationships with governmental departments, downstream wholesalers, and/or other stakeholders in the supply chain. Core members use their social networks to facilitate their own welfare while also increasing the welfare of the other members in the cooperative (Li and Zheng 2008). Thus, the social networks of core members can be regarded as the publicly owned social capital of the cooperative. However, in many Chinese studies, the social networks of core members are taken as the complete content of social capital, which causes insufficient measuring of social capital(Li and Zheng 2008).

Second, farmer cooperatives in China feature small scales and locality (Liang and Hendrikse 2013). Members are basically from the same town and know one another relatively well, which establishes a community-based cooperation foundation and an even more important role of social capital in China (Xu 2005, Zhao and Li 2007). Community is considered a central governance of

[1]**Data source.**The ministry of Agriculture of the People's Republic of China, http://www.moa.gov.cn/

social capital (Bowles and Gintis 2002, Hayami 2009). Communities featured by social capital address some market and state failures by solving problems when individuals interact in ways that cannot be regulated by complete contracts due to the complexity of the transactions. A series of conventional norms are created based on community-based member relationships. The reputations of members or managers are damaged if they betray the norms, which can be a substantial punishment for them.

Hypotheses

We develop three indicators to represent social capital, i.e. external dimension, relational dimension, and cognitive dimension. Four hypotheses regarding the impacts of social capital on member participation and economic performance are formulated in this subsection.

Social Capital and Member Participation in Farmer Cooperatives

The association of social capital with civic participation has frequently been investigated (Putnam 1995, Chloupkova et al. 2003, Teorell 2003). In a society with a high level of social capital, civic engagement of citizens – as embodied in practices such as voting, newspaper readership, and memberships in clubs –is popular (Putnam 1993, 1995). However, engagement in social and cultural associations is weak in cities where there are low levels of social capital. Civic engagement can further facilitate information provision, coordination, and communication, can promote the effectiveness of the government, and may even be a precondition for economic development.

Applying social capital in the role of personal participation in organizations is inadequate. Uphoff (1992) maintains that social capital can promote cooperation and participation in cooperative actions at both the personal and the organizational levels. Olstrom (1994) emphasizes that social capital is a prerequisite for farmers to undertake collective actions. The importance of different forms of social capital to participation varies (Brown and Ashman 1996). The relational and cognitive dimensions of social capital may be more important to facilitate collective action, whereas the external social capital exerts an indirect influence. Therefore, we present Hypotheses *1a*, *1b*, and *1c*:

H1a: Relationships between the chairperson and stakeholders of a cooperative–which represents the external social capital–have no direct influence on members' participation in collective activities.

H1b: A higher level of trust within a farmer cooperative–which represents the relational dimension of social capital–facilitates members' participation in collective activities.

H1c: The understandings of collective orientation and mission that members hold in common within a farmer cooperative–which represents the cognitive dimension of social capital–promotes members' participation in collective activities.

Social Capital and Economic Performance

Networks are essential to the development of cooperatives (Novkovic2013). Firms are generally embedded in social networks with other actors (Andersson et al. 2002). Inter-organizational relationships between firms can be a source of competitive advantage (Dyer and Singh 1998). Stable and broad social networks with transaction partners not only eliminate opportunistic behaviors but also gain additional information and sources. Networks can affect enterprise performance directly by providing entrepreneurs with information about technologies and markets. As technical information and market information grows, it has a direct effect on a firm's productivity or help enterprises become more competitive. Innovation may also occur due to information exchange and trust among partners (Knack and Keefer 1997). Social networks extend the resource exchange and linkages between individuals and groups, which promotes product innovation and speeds the diffusion of innovations (Robison et al. 2002, Tsai and Ghoshal 1998). Moreover, new economic opportunities may arise from social capital-based networks (Bingen et al. 2003).

External networks and the social ties of cooperatives with both vertically and horizontally related organizations –including input suppliers, clients, cooperators, competitors, and the government – affect the performance of farmer cooperatives. First, these networks and social ties facilitate the exchange of information within networks and save on information costs. Under the condition of information asymmetry, reliable relationships with transaction partners and governments can help farmer cooperatives save on costly negotiations (transaction costs) and on information-searching processes. Moreover, previous experience and/or close contact with a partner generate helpful information (Hagedoorn 2006). For example, the government tends to provide subsidies to cooperatives that are in close contact with it. Second, social ties help reduce opportunistic behaviors between members of a network, which makes negotiation less costly (Zaheer et al. 1998, Gulati et al. 2000). Firms within the network conduct transactions on the basis of long-term cooperation. Thus, they hesitate to behave opportunistically to maintain their reputation. Therefore, we present Hypothesis 2:

> *H2: Closer relationships between the chairperson and stakeholders of a cooperative –which represent the external dimension of social capital –produce better economic performance for the cooperative.*

Social capital provides an informal institutional framework with shared information, cooperation, and collective decision making (Zhao 2003). A person spends less to protect himself from opportunistic behaviors during transactions in the context of high levels of trust. Trust between persons can be a substitute for contracts to a certain extent. According to Arrow (1972), trust is essential in every transaction. People working together try to find better ways of making possible achievements that, in the absence of social capital, would be not possible (Ostrom 1994, Coleman 1988). Innovation in the form of new products or technology may be discouraged in a low trust group, due to managers devoting more time to preventing malfeasance by employees or members and less time to innovation (Knack and Keefer 1997).The more trust that members share, the fewer transaction costs they pay. Both the flow and quality of information are improved, and better outcomes are achieved (Granovetter 2005).The benefits of trust on firm

performance have been widely investigated and recognized (Hansen et al. 2002, Keefer and Knack 1997).

Cooperatives are characterized by dual attributes, an economic attribute and a social attribute (Hendrikse 2007). Both profit maximization in the market and members' economic and non-economic benefits are pursuit of cooperatives. Valentinov (2004) argues that interpersonal relations between members have an essential influence on the coordination and decision-making costs of a cooperative. Trust solves problems of "common property" or vaguely defined property rights problems (Narayan and Pritchett 1997). Nilsson et al. (2012) believes that the trust that members have is the resource base of cooperatives. This trust creates possibilities to cooperate and smoothes communication and coordination within a cooperative, which reduces transaction costs and generates economic benefits. Therefore, we present Hypothesis 3:

> *H3: A higher level of trust within a farmer cooperative – which represents the relational dimension of social capital – leads to better economic outcome.*

Ostrom (1994) notes that farmers must understand the principles, decision rights and benefit allocation rules; in addition, they must understand development and financial status and other various strategies of cooperatives. Members' common interests or a common understanding of goals is one of the factors critical to the success of farmer cooperatives. First, a common understanding of collective orientation and missions strengthens members' identification, sequentially contributing to build trust and to minimize opportunistic behavior (Ouchi 1980, Rudd 2000, Ole Borgen 2001, Pearson et al. 2008). Second, homogeneity in members' interests holds members together, eliminates misunderstanding during communications, and saves on decision-making costs. Third, more shared goals among members in an organization contribute to knowledge sharing (Chow and Chan 2008). The costs of information searching and transmission are low in a firm with a good knowledge sharing base. We therefore present Hypothesis 4:

> *H4: The understandings of collective orientation and mission that members hold in common within a farmer cooperative – which represents the cognitive dimension of social capital – contribute to better economic outcomes of the cooperative.*

Methodology

To understand the impact of social capital on member participation and economic performance, we employ statistical analysis with a sample of farmer cooperatives from China's Taizhou and Jiaxing city. The model, data, and measures of various variables are specified in this section.

Model

Based on the four hypotheses formulated in the previous section, the association of social capital with member participation and the economic performance of cooperatives is depicted in Figure 1. We hypothesize that social capital has a positive impact on both member participation in collective activities and the economic performance of farmer cooperatives.

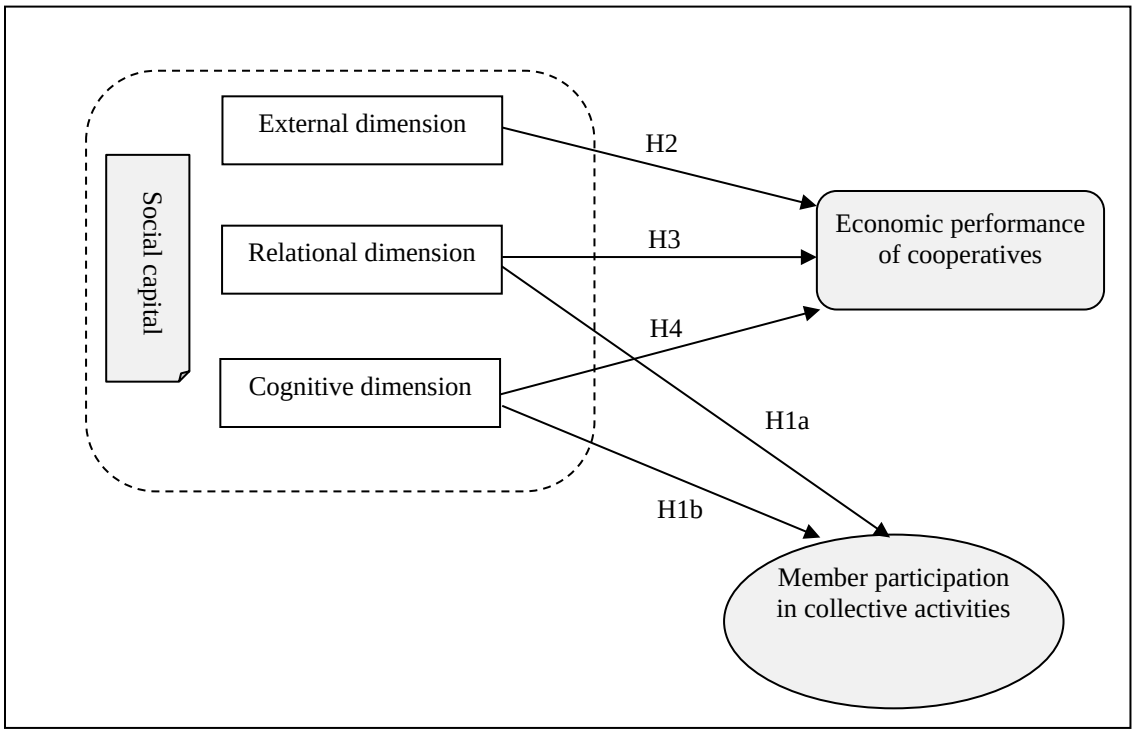


Figure 1. The association between social capital and member participation in collective activities and the economic performance of cooperatives.

The models pertaining to the four hypotheses are shown as the following:

$$B = \alpha_0 + \alpha_1 external + \alpha_2 relational + \alpha_3 cognitive + \varepsilon, \text{ and}$$
$$P = \beta_0 + \beta_1 external + \beta_2 relational + \beta_3 cognitive + \gamma,$$

where social capital is denoted as$S$; the three dimensions of social capital are referred to as$external$, $relational$, and $cognitive$, respectively; member participation is denoted as B;the economic performance of the cooperative is represented by P;α_i and $\beta_i$denote the parameters; and ε and $\gamma$are the error terms.

Measurements

Measurements concerning each dimension of social capital, member participation, economic performance, and control variables are specified in this subsection.

Social Capital

Due to the difficulty of direct measurement, various proxies are applied to conceptualize and measure social capital. The measurements used are partially borrowed from Tsai and Ghoshal (1998) and meanwhile customized to farmer cooperatives in China. All the measures of social capital are shown in Table 1.

External Dimension

Due to the dominant position of chairpersons in the management and operation of cooperatives (Liang and Hendrikse 2013), the social ties of the chairperson with other organizations and people are roughly taken as the external dimension of social capital. The extent of closeness that the chairperson has with five types of stakeholders, *input suppliers, managers of other cooperatives and agricultural firms, wholesalers or clients, officials from the government,* and *managers of cooperative unions or associations,* is used to measure the structural dimension of social capital. We use a 5-point scale ranging from 'not close at all' to 'extremely close' to evaluate the answers to the five questions. An exploratory factor analysis of the five variables yields a one-factor measure of the external dimension of social capital in each sample.

Relational Dimension

The mutual trust between managers and members and the trust among members represent the relational dimension of social capital. We utilize three inquiry questions:

1. *Please indicate the extent to which members trust the managers' capabilities in service provision, products' market recognition, and enhancing members' income*.

2. *To what extent do you trust that members are committed to the bylaws and delivery obligation of the cooperative*?

3. *Please evaluate the extent of cohesion and trust between members*.

To measure the trust within a farmer cooperative. A 5-point scale with choices: *'do not trust at all', 'basically trust', 'trust', 'quite trust', and 'completely trust'* is applied to evaluate the answers to those questions. A one factor-measure of the relational dimension of social capital is produced from the three variables by an exploratory factor analysis.

Cognitive Dimension

The cognitive dimension refers to a shared vision that facilitates the understanding of collective orientation and missions and ways of acting in an organization. "*Members have a common understanding about the collective orientation and mission of the cooperative*" is applied as a variable of the cognitive dimension of social capital. A 5-point scale ranging from 'not right at all' to 'extremely right' is used to evaluate the answer to the question.

Table 1. Measurements of the three dimensions of social capital

	Measurements	Evaluation
External Dimension	1) How close are the relationships you have with input suppliers? 2) How close are the relationships you have with managers of other cooperatives and agricultural firms? 3) How close are the relationships you have with wholesalers or clients? 4) How close are the relationships you have with officials from the government? 5) How close are the relationships you have with managers of cooperative unions or associations?	① not close at all ② not so close ③ close ④ very close ⑤ extremely close
Relational Dimension	1) Please indicate to what extent members trust the managers' capabilities in service provision, products' market recognition, and enhancing members' income. 2) To what extent do you trust that members are committed to the bylaws and delivery obligation of the cooperative? 3) Please evaluate the extent of trust between members.	① not trust at all ② basically trust ③ trust ④ quite trust ⑤ completely trust
Cognitive Dimension	Members have a common understanding about the collective orientation and the mission of the cooperative.	① not right at all ② basically right ③right ④ quite right ⑤ extremely right

Member Participation

Members participate in various activities in farmer cooperatives in China, which can be categorized primarily as capital participation, transaction participation, and management participation (Shao 2014). Capital participation refers to the capital shares that members hold. Transaction participation consists of members' products delivered to the cooperative. Management participation indicates members' involvement in decision making. However, common members in Chinese farmer cooperatives do not have much freedom to choose the extent of their participation in capital shares, transactions, and management (Huang and Xu 2008, Liang et al., forthcoming). Core members dominate capital shareholding, decision making, and profit distribution. Thus, common members do not have sufficient options to participate in the collective activities of a Chinese farmer cooperative. In essence, common members basically only choose whether to participate in technical trainings and general meetings. Thus, we use "*proportion of members participating in trainings*" and "*proportion of members participating in general meetings*" as the measurements of member participation. They are calculated by the number of relevant members divided by membership size. Members are assumed to be informed of all the trainings and meetings.

Economic Performance

Social capital is formed at an organizational level rather than the individual farmer level. Hence, the sale value of cooperatives is used to measure economic performance.

Control Variables

The location, size, and year of foundation of cooperatives may affect the performance of cooperatives (Huang 2009). In addition, the chairperson's gender, education level, age, working experience, Communist Party membership, and capital shares affect a cooperative's performance (Huang et al. 2008, Guo and Lou 2009). Therefore, all these factors are controlled during modeling.

Data

The data consists of both documentary materials and first-hand data. Face-to-face interviews were conducted to collect first-hand data. We chose farmer cooperatives in two cities in China's Zhejiang province, Jiaxing and Taizhou, for two reasons. First, cooperatives in China are in the eastern area where the economy is more market oriented and industrialized than in western China. Zhejiang is located in southeast China and is one of China's most developed provinces. More importantly, Zhejiang is leading the way in the development of farmer cooperatives in China in terms of both quantity and quality. As of the end of 2013, there are 53,168 farmer cooperatives in Zhejiang.[2]

Second, Jiaxing and Taizhou are located in the northeast and middle of Zhejiang, respectively (see Figure 2), and are two of the most developed cities in Zhejiang. They have parallel GDPs and marketization levels. We chose these two cities to control for the general development status and performance of farmer cooperatives with a limited differential. The areas of Taizhou and Jiaxing are approximately 9,400km^2 and 4,000 km^2, respectively. There are more than 7,000 farmer cooperatives in Taizhou and more than 3,000 farmer cooperatives in Jiaxing.

Figure 2. Map Zhejiang

[2] **Data Source.** Zhejiang Administration of Industry and Commerce.

We chose 100 farmer cooperatives in Jiaxing and 100 in Taizhou from the lists of cooperatives by random sampling and conducted face-to-face interviews with the chairperson of each cooperative. Data regarding the chairperson's personal information, measures of the external, relational, and cognitive dimensions of social capital, members' collective activities, and cooperative-level information, such as membership size, shareholder structure, and profits, were collected. We interviewed the chairpersons of 83 farmer cooperatives in Jiaxing and 70 in Taizhou due to the unavailability of chairpersons at the other cooperatives. Questionnaires with missing data were discarded. Ultimately, we had a database consisting of 147 farmer cooperatives, with 81 cases from Jiaxing and 66 cases from Taizhou.[3]

Data and Results

Descriptive Results of Data

This section presents the descriptive results of the data and the statistical results of the models. All the variables, as well as the mean, standard deviation, minimum and maximum values of each variable, are displayed in Table 2.

Table 2. Descriptive statistics

Variable	Description	Mean	S.D.	Min	Max
Economic Performance					
Sale value	Log of sale value in a year	5.785	1.56	1.609	9.435
Participation Behaviors					
Technical training	Members participating in trainings (%)	0.878	0.219	0	1
General meeting	Members participating in general meetings (%)	0.745	0.365	0	1
Social Capital					
External dimension	Factor yielded by factor analysis of the five variables	-0.000	0.819	-2.065	1.77
Relational dimension	Factor yielded by factor analysis of the three initial variables	-0.000	0.795	-1.387	0.638
Cognitive dimension	A common understanding of the collective orientation and mission of the cooperative=1, otherwise=0	0.623	0.486	0	1
Control Variables					
Location	Jiaxing=1,Taizhou=0	0.569	0.497	0	1
Size	Number of members	68.109	65.958	5	410
Foundation	Year	6.446	3.093	1	13
Gender chairperson	Male=1,female=0	0.838	0.369	0	1
Education chairperson	Year	10.913	2.944	0	15
Age chairperson	Year	47.315	7.589	28	63
Working experience Chairperson	With non-agricultural working experience=1,otherwise=0	0.723	0.449	0	1
Communist Party membership chairperson	Party member=1,otherwise=0	0.357	0.481	0	1
Capital shares chairperson	%	19.411	15.586	1	100

[3]The questionnaire used to conduct the interviews can be obtained by contacting the corresponding author.

Statistical Results

Table 3 displays the impacts of social capital on member participation in training and general meetings. The external dimension of social capital has no significant impact on members' participation in technical training or general meetings. Hypothesis 1a is therefore confirmed. The relational dimension of social capital is positively associated with members' participation in training, indicating that trust in a farmer cooperative provides an incentive for members to participate in training. The cognitive dimension of social capital has a significantly positive influence on members' participation in general meetings. Members who have a common understanding of collective orientation and mission are more likely to attend general meetings. Therefore, hypothesis H1b and H1c, which state that a higher level of relational and cognitive dimensions of social capital within a farmer cooperative facilitates members' participation in collective actions, is confirmed.

Table 3. OLS regression results regarding the effects of social capital on members' participation behaviors in farmer cooperatives

Variable	**Model 1** **Training Participation**	**Model 2** **Meeting Participation**
External dimension	0.023	0.005
	(0.73)	(0.11)
Relational dimension	0.046*	0.018
	(1.86)	(0.50)
Cognitive dimension	-0.002	0.221***
	(-0.06)	(2.97)
Location	-0.109**	0.159**
	(-2.50)	(2.13)
Size	-0.002***	-0.002***
	(-4.73)	(-4.47)
Foundation	-0.000	-0.006
	(-0.03)	(-0.59)
Gender chairperson	-0.042	-0.008
	(-0.75)	(-0.10)
Education chairperson	-0.026**	0.007
	(-2.11)	(0.63)
Age chairperson	-0.006	-0.005
	(-1.53)	(-1.10)
Working experience chairperson	-0.009	0.024
	(-0.21)	(0.31)
Communist party membership chairperson	0.048	-0.010
	(-1.15)	(-0.15)
Capital shares chairperson	-0.001	0.003**
	(-0.54)	(2.20)
Constant	1.665***	0.724***
	(5.49)	(2.72)
$\mathbf{R^2}$	0.350	0.468

Note. ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, with t-values in parentheses.

Table 4 presents the impacts of social capital on the economic performance of the cooperatives. Variables are entered into the estimation with the following steps: (1) control variables, (2) the external dimension of social capital and control variables, (3) the relational dimension of social capital and control variables, (4)the cognitive dimension of social capital and control variables, and (5) all the independent and control variables. Table 4 shows that all three dimensions of social capital make significant contributions to the economic performance of cooperatives. Therefore, hypotheses 2, 3, and 4, regarding the positive impacts of the three dimensions of social capital on the performance of cooperatives, are all confirmed.

Table 4.OLS regression results regarding the effects of social capital on the economic performance of cooperatives

Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Location	-0.910***	-0.642***	-1.037***	-0.983***	-0.899***
	(-3.49)	(-2.90)	(-3.85)	(-3.70)	(-3.66)
Size	0.004*	0.003	0.004*	0.004	0.004*
	(1.76)	(1.61)	(1.82)	(1.58)	(1.61)
Foundation	0.155***	0.147***	0.144***	0.176***	0.154***
	(3.30)	(3.04)	(3.18)	(3.40)	(3.05)
Gender chairperson	0.304	0.356	0.120	0.349	0.171
	(1.02)	(1.22)	(0.39)	(1.23)	(0.60)
Education chairperson	0.003	0.028	-0.009	-0.006	0.001
	(0.04)	(0.38)	(-0.12)	(-0.08)	(0.02)
Age chairperson	0.011	0.022	0.006	0.011	0.015
	(0.57)	(0.99)	(0.28)	(0.56)	(0.70)
Working experience chairperson	-0.251	-0.215	-0.212	-0.162	-0.083
	(-0.82)	(-0.71)	(-0.71)	(-0.54)	(-0.29)
Party membership chairperson	-0.157	-0.194	-0.124	-0.129	-0.176
	(-0.58)	(-0.74)	-0.46)	(-0.49)	(-0.71)
Capital shares chairperson	-0.006	-0.006	-0.004	-0.008	-0.004
	(-0.59)	(-0.58)	(-0.40)	(-0.77)	(-0.44)
External dimension		0.354**			0.440**
		(2.15)			(2.59)
Relational dimension			0.276**		0.505***
			(2.02)		(3.70)
Cognitive dimension				0.518**	0.561**
				(2.12)	(2.33)
_Cons	4.695***	3.767**	5.287***	4.309**	4.135**
	(2.85)	(2.04)	(3.24)	(2.60)	(2.38)
$\mathbf{R^2}$	0.434	0.456	0.437	0.457	0.504

Note.***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, with t-values in parentheses.

Although we already consider the size of the cooperatives as a controlled variable, we still used the sales per member as the measure of performance to test the robustness of our results. The results regarding the impact of social capital on performance in terms of sales per member are

presented in Table 1A (see Appendix). The robustness is confirmed because the same results were derived from the two models with sale value and sale value per member as the measure of performance respectively.

In addition, geographical location, membership size, and the age of cooperatives are positively related to economic performance. Cooperatives in Taizhou basically have better performance than those in Jiaxing, which may be due to the different levels of agricultural economic development. Although the economic level of Taizhou is not higher than that of Jiaxing, Taizhou is more specialized in agriculture. The agricultural industry accounts for 6.87% of the gross production of value in Taizhou, whereas that equivalent value is 5.33% in Jiaxing.[4]The positive influence of membership size and the age of cooperatives on economic performance has also been found in prior studies (Liang 2011, Fu 2013).

Furthermore, a cross-product interaction analysis was performed to examine whether the interactions of the three dimensions of social capital affect performance. However, the inclusion of cross-production interaction may result in a multicollinearity problem. We therefore calculate the interaction coefficients by subtracting the mean from the original value of the three dimensions of social capital (Allison 1977). The results are presented in Table 5 (see Appendix) and show a significantly negative interaction between the external and cognitive dimensions of social capital. These results are interpreted to indicate that the impact of external social capital on performance additionally depends on the magnitude of cognitive social capital. A higher level of cognitive social capital leads to a reduced impact of external social capital on performance. In the same sense, a higher level of external social capital reduces the effects of cognitive social capital on performance.

Discussion

This section discusses the results displayed in the previous section, i.e., the effects of social capital on members' participation and economic performance.

Social Capital and Members' Participation

Our study confirms the findings of Brown and Ashman (1996) that the importance varies of the different dimensions of social capital to participation, i.e., the relational and cognitive dimensions of social capital have a positive impact on members' participation in technical training and general meetings in farmer cooperatives in China, whereas external social capital is not significantly associated with member participation. More specifically, members' trust in managers and their collective orientation increases loyalty and enthusiasm in participating in various technical training sessions and in general meetings organized by managers. However, most common members in Chinese cooperatives specialize in production, whereas only a few entrepreneurial members are responsible for management of the cooperative and product marketing (Liang et al., forthcoming). Therefore, these common members are not aware of the relationships between a few entrepreneurial members and outside stakeholders of the cooperative.

[4] **Data source.** Taizhou Statistical Yearbook 2012, Jiaxing Statistical Yearbook 2012.

Social Capital and Economic Performance

The associations between the three dimensions of social capital and the economic performance of farmer cooperatives are specified.

External Dimension of Social Capital

The results of the empirical analysis demonstrate that external networks or the social ties of cooperatives with both vertically and horizontally related stakeholders – such as input suppliers, clients, cooperators, competitors, and the government –affect the performance of farmer cooperatives. The external networks of an organization can produce market information, technology information, and budgetary resources, which are helpful to the economic outcomes of cooperatives (Knack and Keefer 1997, Andersson et al. 2002, Robison et al. 2002, Liang et al., forthcoming).

The term embeddedness is used by many scholars to explain how social networks affect the economic behavior and performance of organizations and how institutional arrangements support transactions (Granovetter 1985, Hagedoorn 2006). Chinese farmer cooperatives' connection with or embeddedness in external organizations is highlighted by many scholars (Xu 2005, Li and Zuo 2013). Li and Zuo (2013) recognize four types of networks in which Chinese farmer cooperatives are embedded: members, the village community, other market participants, and external source providers, such as governments and finance companies. Among the four types of social ties, village community is more likely to be related to the social dimension of cooperatives, whereas the others are more typically associated with the economic dimension. Cooperatives' ties with members in the current study are regarded as internal relationships.

Relational Dimension of Social Capital

Trust within farmer cooperatives –including trust both among members and between members and managers – is positively associated with the economic performance of cooperatives. As (1997) state, trust tends to reduce enforcement costs and strengthen commitment to joint activities. However, Hansen et al. (2002) argue that the effects of the different manifestations of trust on performance of cooperatives depend on organizational contexts. The complexity of services provided and geographic dispersion of members and facilities are two primary characteristics that influence the effects of trust on performance. They argue that when cooperatives provide more complex services and/or members have greater geographic dispersion, trust among members is more important than trust between members and managers, and vice versa. Cooperatives in China are characterized by limited services, such as input supplies, technique training, and sales, and only 8% of cooperatives offer members process services. All the cooperatives investigated in the current study have a relatively small membership and condensed geographic dispersion of members. The average membership of the investigated cooperatives is 69 and 65% of cooperatives have members geographically from a local town. Hence, trust between members and managers may be more important with respect to the economic performance of cooperatives, whereas trust among members is more associated with the social dimension.

Cooperatives currently face a decrease in trust for various reasons (Valetinov 2004), and it is notable that Chinese farmer cooperatives are no exception. The factors that lead to the tendency of decreasing trust in cooperatives are manifold. First, the enlarging size of cooperatives leads to looser relationships between members, as well as between members and the management, which causes a change in member attitudes toward cooperatives (Feng et al. 2011, Nilsson et al. 2012). Member commitments are relaxed.

Second, management of cooperatives is becoming more powerful and more independent (Bijman et al. 2013). Member managers are playing essential roles in Chinese farmer cooperatives. Furthermore, professional management has been adopted by a few cooperatives, which widens the gap between members and management. Communication and bridging between members and management are more principle-agent based, rather than community and trust based.

Third, cooperatives are becoming more similar to capitalist firms in terms of both internal governance and external activities(Nilsson et al. 2012), which means that they are moving from a defensive orientation to a more offensive orientation in terms of market activities. In addition, members interact with their cooperative on the basis of economic efficiency. Members place more value on economic benefits and transactions that pertain to market activities. Social benefits, which used to be one of the critical incentives driving farmers to join cooperatives, are beginning to be less of a factor. Moreover, as the size of cooperatives increases, the return on economic capital exceeds the return from social capital.

Cognitive Dimension of Social Capital

A common understanding of collective orientation and missions by members contributes to the economic performance of farmer cooperatives, which supports the positions of many scholars (Rudd 2000, Ole Borgen 2001, Chow and Chan 2008, Pearson et al. 2008). A collective orientation is one of the most important preconditions of the genesis and development of farmer cooperatives (Lin and Wang 2002, Wang 2010).An understanding of goals provides an incentive for members to pursue and achieve these goals. Chinese farmer cooperatives typically feature a few core members who dominate. Common members must be sufficiently informed and trained to understand the collective orientation and mission of cooperatives. Management teams must develop clear goals and deliver information to members. Thus, general meetings are quite important.

Nowadays most cooperatives adopt professional management (Bijman et al. 2013). This contributes to the innovation and market orientation of cooperatives (Kyriakopoulos et al. 2004). However, the distance between the management and members is getter larger and members' collective orientation may be drained. Besides, members are more heterogeneous in terms of production size and products due to consumers' demand variance. A series of methods, such as constructing the homepages of the cooperative and electing member representatives who may attend important meetings, may be adopted by cooperatives to keep members informed of the status of the cooperatives. In addition, a proper culture of an organization may help members understand the collective orientation (La Porta et al. 1997). In addition, having a proper culture in an organization helps members understand the collective orientation (La Porta et al. 1997).

Conclusion and Future Research

This study investigates the impact of social capital on member participation in collective activities and on the economic performance of Chinese farmer cooperatives, in particular. It adds to the literature, both theoretically and empirically, regarding the composition, measurement, and role of social capital pertaining to farmer cooperatives. Social capital is indicated by three dimensions, i.e., the external, relational, and cognitive dimensions. These dimensions are interpreted as external networks, trust, and a common understanding of goals and mission, respectively, in this empirical study. The empirical results show the following: 1) members' participation in technical training and general meetings is more active in cooperatives with a higher level of relational and cognitive social capitals, and 2) all three dimensions of social capital positively influence the economic performance of cooperatives.

Social capital is given greater value in organizations characterized by collective action and is also denser when trust and norms being more greatly emphasized (Granovetter 2005). Small groups have denser social capital because people have closer spatial and emotional contacts. Although the creation and benefits of social capital are related to individuals, it is bound to groups and produces goods that are collective (Uphoff and Wijayaratna 2000). The current study, based on data from Chinese farmer cooperatives, confirms the beneficial role of social capital.

Like physical capital and human capital, the creation of social capital requires a sustainable investment of time and effort (Ostrom 1994). It is produced through interactions between individuals and organizations and systems (Gillies 1998).A long-term and focused commitment is required to develop social capital, and its creation is even more difficult than that of physical or human capital due to the commitment required to develop long-term interpersonal relations and the collective participation of all members. As the size and/or member heterogeneity of a group expand, maintaining and growing social capital become increasingly difficult (Coulter et al. 1999, Markelova et al. 2009).Nevertheless, social capital is a resource thatgrows the more it is used (Powell 1996, Gillies 1998). The stock of social capital increases, rather than decreases, with use. Moreover, social capital is characterized by idiosyncrasy or specificity, i.e., it is strongly connected to the personal identity of its bearers and cannot be transferred to other groups without losing value or bearing a cost (Valentinov 2004).

There are various possibilities for future research. We interviewed only chairpersons, used chairpersons' social networks as those of the cooperatives, and took chairpersons' evaluation of trust and members' understanding of collective orientation to roughly measure the relational and cognitive dimensions of social capital, which may be limitations of this study. It would be of value to try an alternative method of measurement, e.g., interviewing members of each cooperative to measure social capital from their perspective.

The volume of social capital may be influenced by sectors (Li and Zuo 2013). We did not examine the impact of social capital on the economic performance of cooperatives among different sectors. It would be helpful to evaluate the impact of social capital on the performance of farmer cooperatives in different product sectors. Cooperatives producing high value added products such as vegetables and fruits of may be more dependent on inter-organizational social capital due to the need for a broad marketing network, while bulk products mostly are provided via wholesale market.

It is logical to argue that social capital provides an incentive for members to participate in collective activities, but members' active participation also helps create social capital (Wollebaek and Selle 2002). Lin (1999) also states that, all scholars remain committed to the view that it is the interacting members who contribute to the maintenance and building of social capital. It would contribute to the current study by investigating the interaction between social capital and member activities.

The dependent nature of cooperatives on social capital causes limitations as well. Zhao (2003) specifies that the presence of social capital may restrain the entry of outsiders, limit members' business motivation and innovation, and delay the promotion of some talented individuals. Studies concerning the negative influence of social capital on the development of farmer cooperatives, such as the impact of social capital on agricultural firms' product innovation, would be interesting.

Acknowledgements

This research is supported by Zhejiang Provincial Natural Science Foundation of China project (Grant No. LQ14G030041), Zhejiang Philosophy and Social Science project (Grant No. 13JDQY01YB), and the National Natural Science Foundation of China project (Grant No. 71373063, Grant No. 71333011).

References

Adler, P.S., and S. Kwon. 2002. Social capital: Prospects for a new concept. *Academy of Management Review* 27 (1): 17-40.

Allison, P.D. 1977. Testing for interaction in multiple Regression. *American Journal of Sociology* 83: 144–153.

Andersson, U., M. Forsgren, and U. Holm. 2002. The strategic impact of external networks: subsidiary performance and competence development in the multinational corporation. *Strategic Management Journal* 23 (11): 979-996.

Arrow, K.J. 1972. Gifts and exchanges. *Philosophy & Public Affairs* 1(4):343-362.

Beugelsdijk, S. and T. Van Schaik. 2005. Social capital and growth in European regions: an empirical test. *European Journal of Political Economy* 21 (2): 301-324.

Bijman, J., G. Hendrikse, and A.van Oijen.2013. Accommodating two worlds in one organisation: changing board models in agriculturalcooperatives. *Managerial and Decision Economics* 34(3-5): 204-217.

Bingen, J., A. Serrano, and J. Howard. 2003. Linking farmers to markets: Different approaches to human capital development. *Food Policy* 28 (4): 405-419.

Brown, L.D., and D. Ashman. 1996. Participation, social capital, and intersectoral problem solving: African and Asian cases. *World Development* 24(9): 1467-1479.

Bowles, S., and H. Gintis. 2002. Social capital and community governance. *EconomicJournal* 112: 419-436.

Chloupkova, J.G., L.H. Svendsen, and G.T. Svendsen.2003. Building and destroying social capital: The case of cooperative movements in Denmark and Poland. *Agriculture and Human values* 20 (3): 241-252.

Chow, W.S., and L.S. Chan.2008. Social network, social trust and shared goals in organizational knowledge sharing. *Information & Management* 45 (7): 458-465.

Coleman, J.S. 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94: 95-120.

Cook, M.L. 1995. The future of US agricultural cooperatives: A neo-institutional approach. *American Journal of Agricultural Economics* 77(5): 1153-1159.

Cooke, P., and N. Clifton. 2004. Spatial variation in social capital among UK small and medium-sized enterprises. In *Entrepreneurship and Regional Economic Development: A Spatial Perspective*, edited by P. Nijkamp, R. Stough, and H. de Groot. Edward Elgar: Cheltenham.

Cooke, P., N. Clifton, and M. Oleaga. 2005. Social capital, firm embeddedness and regional development. *Regional Studies* 39 (8): 1065-1077.

Coulter, J., A.Goodland, A.Tallontire, and R.Stringfellow. 1999. Marrying Farmer Cooperation andContract Farming for Service Provision in Liberalising Sub-Saharan Africa. ODI Natural ResourcePerspectives, Number 48.

Dunn, J.R. 1988. Basic Cooperative Principles and Their Relationship to Selected Practices. *Journal of Agricultural Cooperation* 3: 83-93.

Dyer, J.H., and H. Singh.1998. The relational view: cooperativestrategy and sources of inter-organisational competitiveadvantage. *Academy of Management Review* 23: 660-679.

Feng, L., J. Nilsson, P. Ollila, and K. Karantininis. 2011. The human values behind farmers' loyalty to their cooperatives. Paper presented at the 5th international conference on Economics and Management of Networks, Limassol, Cyprus,December.

Fu, Y. 2013. Study on the Efficiency of Agricultural Cooperatives: The Static and Dynamic Analyses based on the Objective Function. Ph.D. diss., Zhejiang University, China.

Gillies, 1998. Effectiveness of alliances and partnerships for health promotion. *Health Promotion International* 13(2): 99-120.

Granovetter, M. 1985. Economic action and social structure: Theproblem of embeddedness. *American Journal of Sociology* 91: 481-510.

Granovetter, M. 2005. The impact of social structure on economic outcomes. *The Journal of Economic Perspectives* 19 (1): 33-50.

Gulati, R., N. Nohria, and A.Zaheer. 2000. Strategic networks. *Strategic Management Journal* 21:203-215.

Guo, H., and D. Lou. 2009. Factors influencing the development of farmer cooperatives: Based on cases from Zhejiang. *Chinese Rural Economy* 8: 24-31.

Hagedoorn, J. 2006. Understanding the cross-level embeddedness of interfirm partnership formation. *Academy of management review* 31 (3): 670-680.

Hansen, M.H., J.L. Morrow Jr., and J.C. Batista. 2002. The impact of trust on cooperative membership retention, performance, and satisfaction: an exploratory study. *The International Food and Agribusiness Management Review* 5 (1): 41-59.

Hansmann, H. 1996. *The Ownership of Enterprise*. The Belknap Press of Harvard University Press, Cambridge, MA.

Hayami, Y. 2009. Social Capital, Human Capital and the Community Mechanism: Toward a Conceptual Framework for Economists. *Journal of Development Studies* 45: 96-123.

Hazell, P., C. Poulton, S. Wiggins, and A. Dorward. 2006. The future of small farms: synthesis paper. Based on Research Workshop organized by IFPRI, ODI and Imperial College, Wye.

Hendrikse, G.W.J. 2007. Boards in cooperatives versus corporation: Irrelevance and incentives. In *Vertical Markets and Cooperative Hierarchies*, edited by K. Karantininis and J. Nilsson, 137-150. Elsevier: Amsterdam.

Hind, A.M. 1997. The changing values of the cooperative and its business focus. *American Journal of Agricultural Economics*79(4): 1077-1082.

Hogeland, J.A. 2006. The economic culture of US agricultural cooperatives. *Culture & Agriculture* 28(2): 67-79.

Huang, X. 2009. Performance of farmer cooperatives. Ph.D. Diss., Sichuan Agricultural University, China.

Huang, S., J. Lin, and X. Xu. 2008. Governance mechanism and performance of farmer cooperatives. *Chinese Rural Economy* 3: 65-73.

Huang, S. and X. Xu. 2008. Analysis on member heterogeneity and organizational structure of farmer cooperatives. *Journal of Nanjing Agricultural University (Social Science Version)* 8(3): 1-7, 43.

Knack, S. and P. Keefer. 1997. Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics* 112 (4): 1251-1288.

Kyriakopoulos, K., M. Meulenberg, and J. Nilsson. 2004. The impact of cooperative structure and firm culture on market orientation and performance. *Agribusiness*20 (4): 379–396.

La Porta, R., F.Lopez-de-Silanes, A.Shleifer, and R.W. Vishny. 1997. Trust in large organization. *American Economic Review* 87: 333-338.

Lang, K.A. 2006. Cognition, agency theory and organizational failure: A Saskatchewan wheat pool case study. Master Thesis, University of Saskatchewan, Saskatoon, Canada.

Lee, R. 2009. Social capital and business and management: Setting a research agenda. *International Journal of Management Reviews* 11(3): 247-273.

LeVay, C., 1983. Agricultural co-operative theory: A review. *Journal of Agricultural Economics* 34(1): 1-44.

Li, J., and Y. Zheng. 2008. Rural elite, social capital, and trends of rural cooperatives. *Social Science Studies* 2: 82-85.

Li, C., and T. Zuo. 2013. Building the survival space of cooperatives under the perspective of 'embeddedness': Based on a farmer cooperative in Yanchi. *Issues in Agricultural Economy* 6: 30-36.

Liang, Q. 2011. The Impact of Cooperatives on Famers'Production Income and Scale Efficiency: Based on a Theoretical Model and Empirical Analyses. Ph.D. diss., Zhejiang University, China.

Liang, Q., and G. Hendrikse. 2013. Core and common members in the genesis of farmer cooperatives in China. *Managerial and Decision Economics* 34(3-5):117-361.

Liang, Q., G. Hendrikse, Z. Huang, and X. Xu. Governance structure of Chinese Farmer Cooperatives: Evidence from Zhejiang Province. *Agribusiness*, Forthcoming.

Lin, N. 1999. Building a network theory of social capital. *Connections* 22 (1): 28-51.

Lin, J., and Y. Ma. 2006. The boundary between farmer cooperatives and IOFs: From the perspective of transaction cost and organizational cost. *Agricultural Economics Issue* 3: 16-20.

Lin, J., and N.Wang.2002. Equality and efficiency: Principles and institutional arrangement of farmer cooperatives. *Issues in Agricultural Economy* 9:46-49.

Luo, Q., and Z. Wang. 2010. Social capital and governance of collective action dilemma in farmer cooperative economic organization. *The Chinese Cooperative Economic Review* 10: 107-114.

Lyon, F., 2000. Trust, networks and norms: the creation of social capital in agricultural economies in Ghana. *World Development* 28 (4): 663-681.

Markelova, H., R. Meinzen-Dick, J. Hellin, and S. Dohrn. 2009. Collective action for smallholder market access. *Food policy* 34 (1): 1-7.

Misztal, B.A. 1996. *Trust*. Cambridge: Polity Press.

Nahapiet, J., and S.Ghoshal. 1998. Social Capital, Intellectual Capital, and the Organizational Advantage. *The Academy of Management Review* 23 (2): 242- 266.

Narayan, D., and L.Pritchett. 1997. Cents and sociability: Household income and social capital in Rural Tanzania. World Bank Research Working Paper No. 1796, Washington: The World Bank.

Nilsson, J., and G.W.J. Hendrikse. 2011. Gemeinschaft and Gesellschaft in Cooperatives. In *New Development in the Theory of Networks: Franchising, Alliances and Cooperatives*, edited by M. Tuunanen, J. Windsperger, G. Cliquet, and G. Hendrikse, 339–352. Springer-Verlag: Berlin Heidelberg.

Nilsson, J., G.L.H.Svendsen, and G.T. Svendsen. 2012. Are Large and Complex Agricultural Cooperatives Losing Their Social Capital? *Agribusiness* 28 (2): 187–204.

Novkovic, S. 2013. Reflections on the International Symposium of Co-operative Governance. *Journal of Co-operative Organization and Management* 1: 93-95.

Ole Borgen, S. 2001. Identification as a TrustGenerating Mechanism in Cooperatives. *Annals of Public and Cooperative Economics* 72 (2): 209-228.

Ostrom, E. 1994. Constituting Social Capital and Collective Action. *Journal of Theoretical Politics* 6 (4): 527-562.

Ouchi, W.G. 1980. Markets, bureaucracies, and clans. *Administrative Science Quarterly* 1(25): 129-141.

Pearson, A.W., J.C. Carr, and J.C. Shaw. 2008. Toward a theory of familiness: A social capital perspective.*Entrepreneurship Theory and Practice* 32 (6): 949-969.

Powell, W.W. 1996.Trust-based forms of governance, In*Trust in Organisations*, edited by R.M. Kramer and T.R. Tyler. Thousand Oaks, CA: Sage.

Putnam, R.D. 1993. The prosperous community: Social capital and public life. *American Prospect* 13: 35-42.

Putnam, R.D. 1995. Bowling alone: America's declining social capital. *Journal of Democracy* 6 (1): 65-78.

Robison, L.J., A.A. Schmid, and E.S. Marcelo. 2002. Is social capital really capital? *Review of Social Economy* 60 (1): 1-21.

Royer, J.S., and D.B. Smith. 2007. Patronage Refunds, Producer Expectations, and Optimal Pricing by Agricultural Cooperatives. *Journal of Cooperatives* 20: 1-16.

Rudd, M.A. 2000. Live long and prosper: collective action, social capital and social vision. *Ecological Economics* 34 (1): 131-144.

Shao, K. 2014. The Analysis on the Behaviors of Member Participation in Farmer Specialized Cooperatives. PhD dissertation, Zhejiang University.

Teorell, J. 2003. Linking Social Capital to Political Participation: Voluntary Associations and Networks of Recruitment in Sweden1. *Scandinavian Political Studies* 26 (1): 49-66.

Tribl, C. 2009. Spatial competition of food processing cooperatives in a mixed market–the case of uniform delivered pricing. Working paper, Federal Institute of Agricultural Economics, Austria.

Tsai, W., and S. Ghoshal. 1998. Social capital and value creation: The role of intrafirm networks. *Academy of Management Journal* 41 (4): 464-476.

Uphoff, N. 1992. *Learning from Gal Oya: Possibilities for Participatory Development and Post-Newtonian Social Science*. Ithaca, N.Y: Cornell University Press.

Uphoff, N., and C.M. Wijayaratna. 2000. Demonstrated benefits from social capital: the productivity of farmer organizations in Gal Oya, Sri Lanka. *World Development* 28 (11): 1875-1890.

Valentinov, V. 2004. Toward a social capital theory of cooperative organisation. *Journal of Cooperative Studies* 37 (3): 5-20.

Valentinov, V. 2007. Why are cooperatives important in agriculture? An organizational economics perspective. *Journal of institutional Economics* 3 (1): 55-69.

Wang, Y. 2010. Industry expansion, organization innovation, and farmer cooperative growth. *China Rural Survey* 2: 47-50.

Westlund, H. 2006. *Social Capital in the Knowledge Economy: Theory and Empirics*. Springer: Berlin.

Westlund, H., and F. Adam. 2010. Social Capital and Economic Performance: A Meta-analysis of 65 Studies. *European Planning Studies* 18:6, 893-919.

Wollebaek, D., and P. Selle. 2002. Does participation in voluntary associations contribute to social capital? The impact of intensity, scope, and type. *Nonprofit and Voluntary Sector Quarterly* 31 (1): 32-61.

Wu, W., and A. Leung. 2005. Does a micro-macro link exist between managerial value of reciprocity,social capitaland firm performance? The case of SMEs in China. *Asia Pacific Journal of Management* 22(4): 445-463.

Xu, F., C.Song, and C.Hang. 2013. The influence of social capital on farmer specialized cooperatives. *Theoretic Observation* 12: 82-83.

Xu, X. 2005. Institutional Analysis on Farmer Specialized Cooperatives in China. The Publishing House of Economic Science.

Zaheer, A., B. McEvily, and V. Perrone. 1998. Does trust matter? Exploring the effects of inter-organizational and interpersonal trust on performance. *Organization Science* 9(2): 141-159.

Zhao, Q., and Y. Li. 2007. The cooperative economy ofsocial networks and China's rural society: Based on social capital perspective. *Issues in Agricultural Economy* 8: 40-46.

Zhao, Y. 2003. New trends in social capital theory. *Social Sciences Abroad* 3: 54-59.

Zhang, Q., and H.G. Fung. 2006. China's social capital and financial performance of private enterprises. *Journal of Small Business and Enterprise Development* 13(2): 198 – 207.

Appendix

Table 1A. The impact of social capital on performances (in terms of sale value per member)

Table 1A. The impact of social capital on performances (in terms of sale value per member)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Location	0.510**	0.539**	0.321	0.478**	0.245	0.310	0.244	0.222
	(2.59)	(2.32)	(1.37)	(2.40)	(0.95)	(1.19)	(0.97)	(0.88)
Foundation	0.038	0.037	0.025	0.051	0.043	0.038	0.033	0.041
	(0.88)	(0.86)	(0.59)	(1.14)	(1.01)	(0.92)	(0.78)	(0.96)
Gender chairperson	0.263	0.267	-0.058	0.291	-0.047	-0.052	-0.066	-0.059
	(0.87)	(0.87)	(-0.23)	(0.97)	(-0.19)	(-0.22)	(-0.27)	(-0.24)
Education chairperson	-0.034	-0.032	-0.042	-0.042	-0.056	-0.055	-0.059	-0.057
	(-0.67)	(-0.60)	(-0.83)	(-0.83)	(-1.09)	(-1.08)	(-1.17)	(-1.12)
Age chairperson	0.003	0.004	-0.004	0.002	-0.005	-0.004	-0.008	-0.005
	(0.19)	(0.22)	(-0.30)	(0.15)	(-0.34)	(-0.28)	(-0.52)	(-0.35)
Working experience chairperson	-0.351	-0.350	-0.270	-0.299	-0.193	-0.177	-0.249	-0.223
	(-1.66)	(-1.65)	(-1.44)	(-1.38)	(-0.98)	(-0.89)	(-1.27)	(-1.13)
Party membership chairperson	0.143	0.137	0.234	0.154	0.235	0.292	0.188	0.198
	(0.58)	(0.53)	(1.05)	(0.62)	(1.02)	(1.23)	(0.83)	(0.88)
Capital shares chairperson	0.001	0.001	0.003	0.000	0.002	0.001	0.003	0.002
	(0.09)	(0.10)	(0.49)	(-0.07)	(0.28)	(0.23)	(0.60)	(0.33)
External dimension		0.138*			0.148**	0.124**	0.156**	0.139**
		(1.62)			(2.01)	(2.23)	(2.42)	(2.21)
Relational dimension			0.342**		0.424**	0.314*	0.445**	0.425**
			(2.32)		(2.40)	(1.70)	(2.58)	(2.39)
Cognitive dimension				0.348*	0.513**	0.497**	0.474**	0.486*
				(1.73)	(2.04)	(2.02)	(2.04)	(1.78)
External dimension*relational dimension						0.253		
						(1.17)		
External dimension*cognitive dimension							-0.434*	
							(-1.50)	
Relational dimension*cognitive dimension								-0.202
								(-0.72)
_Cons	0.771	0.685	1.529	0.546	1.279	1.119	1.572	1.387
	(0.66)	(0.51)	(1.35)	(0.47)	(1.07)	(0.95)	(1.30)	(1.14)
R^2	0.081	0.081	0.131	0.099	0.172	0.188	0.195	0.177

Note.***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, with t-values in parentheses.

Table 5. Cross-product interaction analysis regarding the impacts of the three dimensions of social capital on performance

Table 5. Cross-product interaction analysis regarding the impacts of the three dimensions of social capital on performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Location	−0.910***	−0.642***	−1.037***	−0.983***	−0.899***	−0.889***	−0.912***	−0.933***
	(−3.49)	(−2.90)	(−3.85)	(−3.70)	(−3.66)	(−3.66)	(−3.80)	(−3.89)
Size	0.004*	0.003	0.004*	0.004	0.004	0.004	0.004*	0.004*
	(1.76)	(1.61)	(1.82)	(1.58)	(1.61)	(1.62)	(1.73)	(1.69)
Foundation	0.155***	0.147***	0.144***	0.176***	0.154***	0.153***	0.142***	0.149***
	(3.30)	(3.04)	(3.18)	(3.40)	(3.05)	(3.02)	(2.87)	(3.01)
Gender chairperson	0.304	0.356	0.120	0.349	0.171	0.168	0.149	0.153
	(1.02)	(1.22)	(0.39)	(1.23)	(0.60)	(0.60)	(0.51)	(0.52)
Education chairperson	0.003	0.028	−0.009	−0.006	0.001	0.001	−0.003	−0.001
	(0.04)	(0.38)	(−0.12)	(−0.08)	(0.02)	(0.01)	(−0.05)	(−0.01)
Age chairpersons	0.011	0.022	0.006	0.011	0.015	0.015	0.012	0.014
	(0.57)	(0.99)	(0.28)	(0.56)	(0.70)	(0.70)	(0.56)	−0.69)
Working experience chairperson	−0.251	−0.215	−0.212	−0.162	−0.083	−0.082	−0.145	−0.129
	(−0.82)	(−0.71)	(−0.71)	(−0.54)	(−0.29)	(−0.28)	(−0.49)	(−0.45)
Party membership chairperson	−0.157	−0.194	−0.124	−0.129	−0.176	−0.168	−0.227	−0.237
	(−0.58)	(−0.74)	(−0.46)	(−0.49)	(−0.71)	(−0.66)	(−0.91)	(−0.93)
Capital shares chairperson	−0.006	−0.006	−0.004	−0.008	−0.004	−0.004	−0.002	−0.003
	(−0.59)	(−0.58)	(−0.40)	(−0.77)	(−0.44)	(−0.45)	(−0.24)	(−0.35)
External dimension		0.354**			0.440**	0.428***	0.458***	0.434**
		(2.15)			(2.59)	(2.66)	(2.69)	(2.48)
Relational dimension			0.276**		0.505***	0.481***	0.523***	0.508***
			(2.02)		(3.70)	(3.25)	(3.96)	(3.61)
Cognitive dimension				0.518**	0.561**	0.557**	0.512**	0.515**
				(2.12)	(2.33)	(2.32)	(2.18)	(2.08)
External dimension*relational dimension						0.050		
						(0.35)		
External dimension*cognitive dimension							−0.488*	
							(−1.66)	
Relational dimension*cognitive dimension								−0.345
								(−1.43)
_Cons	4.695***	3.767**	5.287***	4.309**	4.135**	4.116**	4.483**	4.314**
	(2.85)	(2.04)	(3.24)	(2.60)	(2.38)	(2.34)	(2.57)	(2.51)
R^2	0.434	0.456	0.437	0.457	0.504	0.504	0.519	0.511

Note.***, ** and * represent significance at the 1%, 5% and 10% levels, respectively, with t-values in parentheses.

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

The Use of Electronic Payment Machines at Farmers Markets: Results from a Choice Experiment Study

R. Karina Gallardo[Ⓘa], Aaron Olanie [b], Rita Ordóñez [c] and Marcia Ostrom[d]

[a] *Associate Professor, School of Economic Sciences and Puyallup Research and Extension Center, Washington State University, 2606 W. Pioneer. Puyallup, Washington, 98371, USA*

[b] *Director of Economic Impact Studies, Economic Modeling Specialists International, 409 South Jackson Street, Moscow, Idaho, 83843, USA*

[c] *Community Food Access Manager, Community Action of Skagit County, 330 Pacific Pl., Mt. Vernon, Washington, 98372, USA*

[d] *Associate Professor, School of the Environment, Center for Sustaining Agriculture and Natural Resources, Washington State University, 1100 N. Western, Wenatchee, Washington, 98801, USA*

Abstract

The use of electronic payment machines offer vendors an alternative payment method which can increase farmers markets' sales and customer base. In this study, we elicited the value that managers and vendors assign to different machines' features. Also we estimated customers' values on different markets' features, including access to electronic payment machines. Managers were willing to pay for user-friendly machines, excellent customer service, and excellent quality machine technology. Customers were also willing to pay for excellent quality food, for vendors that are local farmers, and for an entertaining atmosphere. We found no evidence of customers willing to pay premium prices for having access to electronic payment machines at farmers markets. Findings from this study should be useful to those designing ways to implement electronic payment machines at farmers markets in order to increase adoption rates.

Keywords: electronic payment machines, farmers markets, choice experiment

[Ⓘ]Corresponding author: Tel: +1. 253.445.4584
Email: R. K. Gallardo: karina_gallardo@wsu.edu
A. Olanie:olanie@wsu.edu
R. Ordóñez: ritaromaine@gmail.com
M. Ostrom: mrostrom@wsu.edu

Introduction

Farmers markets are becoming increasingly popular in industrialized countries such as the U.S., E.U., Canada, New Zealand, among others. Whereas countries in Latin America, Africa, and Asia (except Japan) tend to display a larger tradition towards commercializing food products in local village markets with wholesale and retail functions (Reardon et al. 2003). Economic and social factors have increased consumer participation at farmers markets (Pascucci 2011, Varner and Otto 2007, Guthrie et al. 2006, Neil 2002). Economic factors include farmers' need for diversified sources of income and consumers' accessibility to locally grown food. Social factors include development of informal economy and trust, preservation of open space and the positive atmosphere of farmer's markets. This phenomenon is common to industrialized countries, including the U.S. (Gumirakiza et al. 2014, Conner et al. 2010, Brown and Miller 2008, McGarry-Wolf 2005, Neil 2002, Sommer et al. 1981), Italy (Pascucci 2011), New Zealand (Guthrie et al.. 2006), Canada (Feagan 2004), and the U.K. (Lyon et al. 2009, Kirwan 2006, Archer 2003, Trobe 2001). Some consumer segments have the perception that locally produced food is of higher quality and healthier compared to non-local food (Pascucci 2011, Conner et al. 2010, Carpio and Isengildina-Massa 2009, Brown and Miller 2008, Ostrom 2006, Feagan 2004, Zepeda and Leviten-Reid 2004, Trobe 2001, Govindasamy et al. 2000, Murdoch et al. 2000). In general, farmers markets are considered a harbinger of the second industrial revolution, able to attract discerning consumers who exhibit a renewed respect for small-scaled farmers (Guthrie et al. 2006).

In the U.S. farmers markets are an important sales outlet for agricultural producers and have become increasingly critical to the survival of small and midsized specialty-crop farmers, who consider direct marketing to be their most feasible outlet and a way to capture higher returns (Detre et al. 2011). The number and popularity of farmers markets, in the U.S., has increased significantly in recent years, from 1,755 markets in 1994 to 8,144 in 2013, a 364% increase (U.S. Department of Agriculture, Agricultural Marketing Service 2013). Mirroring rapid national growth, sales at farmers markets in Washington State[1] have increased from $5 million total annual gross sales in 1997 to an estimated $50 million in 2010 (Washington State Farmers Markets Association 2013).

Purchases at most markets are made in cash. Research with the U.S. market consumers has found that running out of cash is one of the biggest reasons for limiting market purchases (Lev and Stephenson 2001). In addition, basic food benefits such as those obtained through the Supplemental Nutrition Assistance Program (SNAP)—the largest nutritional assistance program funded by the U.S. Department of Agriculture, Food and Nutrition Service—cannot be accepted at farmers markets without electronic benefit transfer (EBT) technology. In 2005, only 6.8% of farmers markets across the U.S. reported the use of EBT terminals (U.S. Department of Agriculture, Agricultural Marketing Service 2009). This lags far behind the level of participation in food nutrition programs, which is higher than ever before. In 2013, 47.6 million Americans were enrolled in SNAP, at a cost of $79.9 billion (U.S. Department of Agriculture, Food and

[1] The state of Washington, located in the Pacific Northwest region of the U.S. is the 18th largest state in the U.S., with an extension equivalent to 184,661 square kilometers. Washington is the 13th most populated state in the US with 6.9 million people (U.S. Census Bureau 2013). About 60% of the population in the state lives in the Seattle Metropolitan Area.

Nutrition Service 2014). An EBT system enabling SNAP benefit redemptions would enable farmers markets to reach a larger customer base and realize increased sales. In 2013, the total value of SNAP redemptions at farmers markets and farm stands doubled from $2 million to $4 million. While this amount is negligible when compared to the total of $76 billion in redeemed SNAP benefits, it indicates the potential for farmers markets to increase their share of SNAP dollars by making EBT technology available (Wasserman et al. 2010, U.S. Department of Agriculture, Food and Nutrition Service 2014).

This study is part of a project aiming to increase sales of high-value specialty crops at farmers markets and assess the economic potential of wireless electronic payment card machines including EBT/credit and debit (hereafter electronic payment machines). We calculated the economic value farmers markets' managers and vendors who participated in the 2011 Washington farmers market pilot program posited on different features of electronic payment machines. Additionally, we investigated if customers were willing to pay premium prices for food sold at farmers markets' if electronic payment machines were accessible. This should provide cues to policy makers and farmers markets' leaders/advocates where to concentrate efforts to increase technology adoption rates. Also would inform electronic payment machine's providers on the features and services to prioritize in order to increase the use of this technology at farmers markets. Results from this study also signals if customers would be willing to pay premium prices in order to have access to electronic payment machines at farmers markets.

Electronic payment machines were implemented at the 2011 Washington farmers market pilot program, by enabling customers to purchase, at the manager's booth, a specific number of tokens with their credit/debit/EBT card, which they could then spend at the vendors' booths. The tokens differed by transaction type (i.e., credit, debit, EBT) and across markets. Vendors turned in their tokens to the market manager to be reimbursed. During the 2011 season, seventeen participating farmers markets reported sales of $336,499 through the wireless machines, with 11,692 credit, debit, and EBT transactions. Credit card transactions represented 57% ($192,592), debit card transactions 32% ($106,467), and EBT transactions 11% ($37,439) of total sales (Ordóñez 2013). The 2011 Washington farmers market pilot program supplied markets the wireless machine, covering the cost of the machine and costs of the extra battery, carrying case, case of paper, encryption programming fee, payment card industry fee, and wireless network. The pilot program also provided funds for annual fees associated with the machine, funds for marketing materials, and technical assistance with record keeping and accounting. Additional costs—such as the fees per transaction, wages for machine operators, and the time to reconcile transactions and fees charged from bank and processor—were not covered. Some markets covered these costs by charging vendors a percentage of credit/debit sales to cover these costs, while others used the higher stall fees that resulted from increased sales.

Data

In-person interviews were conducted, with twelve managers, forty-eight vendors[2], and ninety-six customers at twelve farmers markets, participating in the 2011 Washington farmers market pilot program, from July to October 2011. We selected these markets to represent a diversity of size

[2] We recognize that the sample size is small, but argue that large samples do not always lead to the soundest results; mostly they would be reflected in the significance of the coefficients. See the discussion in McCloskey (1985) where it is mentioned that statistically significant does not mean substantively or economically significant, and its misinterpretation might lead to inaccurate conclusions.

types and geographical locations across Washington State. At each market we interviewed the market manager, four specialty crop vendors, and eight customers. As required by the Institutional Review Board (IRB) when surveying human subjects, before administering the survey, the respondent was read a cover letter to inform of the study's purpose, assure confidentiality of information provided, and explain the nature of the choice experiment questions. For the latter, it was mentioned to respondents' that there were no right or wrong answers and that the best for the study would be to have their most accurate valuation possible. After the interview, managers and vendors were compensated with $20 in cash and customers with $5 cash.

Survey questions included: (1) discrete choice scenarios to elicit respondents' values for having electronic payment machines at farmers markets; (2) questions about electronic payment machines at farmers markets; (3) general information about the market and the selection of products (for managers and vendors) or purchasing behavior (for customers); and (4) respondents' socio-demographic information. The managers' and customers' surveys refer to the market where the interview took place. Because vendors can sell at more than one market, their survey focused on the market where they had the highest dollar amount of sales for the 2010 season.

Discrete Choice Experimental Design

During the discrete choice experiment, we presented respondents with a set of hypothetical scenarios. For managers and vendors, each scenario referred to a situation in which they were considering purchasing wireless technology with market funds. The scenarios were framed using a set of assumptions to ensure control of factors that could affect decision-making. Note that this set of assumptions was different from the context under the 2011 Washington farmers market pilot program. For example, for the managers' and vendors' surveys, machines would be bought with the market's funds, with no help of grants or subsidies. The market would pay all initial expenses and monthly fees (e.g., wireless network, processing, annual and statement fees). There would be one machine per market, housed in a central location. Customers would buy tokens at this central location, and buy at the vendors' booth using tokens. Volunteers would run the machines (that is, no labor costs would be associated with the operation). Fees per transaction would be passed on to vendors.

To identify the electronic payment machines and farmers markets' features to include in this study, we consulted previous research on consumer purchasing preferences and behaviors at farmers markets (Ragland et al. 2011, U.S. Department of Agriculture, Agricultural Marketing Service 2009, Lev and Stephenson 2001) and spoke to experts on supplying electronic payment machines to farmers markets. In the managers' survey, market features were: (1) costs (the cost of the machine plus the cost of the extra battery, carrying case, case of paper, encryption programming fee, payment card industry fee for an entire season, and wireless network for an entire season)[3]; (2) credit card fees (percentage of dollar amount per transaction); (3) debit card

[3] To closely mimic the costs that managers incur, we used a combination of capital costs (fixed cost of equipment) and variable costs (seasonal wireless fees). We recognize this as a potential limitation of the study. An ideal case would have included fixed and variable costs separately, or calculated the equivalent seasonal cost of owning the machine.

fees (the personal identification number [PIN] fees and the percentage of dollar amount per transaction); (4) EBT fees (charge per transaction); (5) quality of the technology (the ability of the machine provider to supply adequate technical assistance and obtain a reliable wireless signal); and (6) the machine provider's customer service (timely resolution of disputes, capacity for solving problems, and friendly staff).

The vendors' choice scenarios included: (1) quality of the technology, (2) customer service, and (3) fees. We assumed that each market has one central machine and uses tokens for transactions; we considered machine features that would interest vendors in the context of the pilot program. The quality of the technology would affect vendors realizing a sale. If the machine was not working properly customers might be discouraged of buying at the market thus put in danger a potential sale. If the electronic payment machine provider had a poor customer service, markets could experience delays in resolution of potential disputes and vendors would not be reimbursed on time. Fee levels were consistent with average fees charged by wireless machine providers to farmers markets. These fees were presented as a percentage of the sale amount for four types of transactions: credit card, debit card used as credit card, debit card used with PIN, and EBT. For simplicity, we assumed that the sale amount for each of the four transactions equaled $5, with the total dollar amount of the sale being $20.

The consumers' survey presented scenarios related to market features, including: (1) having local farmers as vendors, (2) quality of food offered, (3) atmosphere (e.g., music, bands, or similar entertainment), (4) availability of electronic payment machines, and (5) prices. Prices were set for a bundle of goods rather than for one good, to mimic price levels charged at a farmers' market as realistically as possible. The bundle of goods included one pound of apples, one head of romaine lettuce, one pound of tomatoes, 4.4 ounces of berries, and one pound of onions. The prices were consistent with current prices at Washington farmers markets during the period of the study.

Using the SAS© procedures PROC PLAN and PROC OPTEX we created a main effects design. We based this choice of design on Lusk and Norwood (2005), who found that this type of design generates more precise willingness-to-pay (WTP) estimates. Managers, vendors, and customers were presented with ten, twelve, and seven choice scenarios, respectively. We asked respondents to choose one of three alternatives presented in each choice scenario. For managers and vendors, the first two alternatives offered different combinations of wireless machine and provider features. The third option showed a situation in which no wireless machines would be used at the market. For customers, the first two alternatives described two markets with combinations of the features described above, and the third option allowed respondents not to choose either market. Table 1 presents the wireless machine and provider features given to managers, vendors, and customers. Figure 1 is an example of the choice experiment scenario.

Table 1. Wireless machines, machine providers, and farmers' market features used in the choice experiment scenarios presented to managers, vendors, and customers.

Features	Level 1	Level 2	Level 3
Managers			
Costs Includes cost of the machine, extra battery, carrying case, case of paper, encryption programming fee, payment card industry (PC) fee, statement fee (for all season), wireless network (for all season)	$675.00	$775.00	$875.00
Credit fees Percentage of total sales per transaction	1.69%	1.74%	1.78%
Debit fees Including PIN fees, percentage of total sales per transaction	1.40%	1.55%	1.89%
EBT Dollars per transaction	$0.09	$0.15	$0.35
Quality of technology Technical assistance, wireless signal, etc.	Poor	Excellent	
Customer service Timely resolution of disputes, capacity of solving problems, friendly staff	Poor	Excellent	
Ease of use	Not user friendly	User friendly	
Vendors			
Fees Percent fees, includes all fees for four transactions: with credit card, debit card, debit card PIN, EBT. Each transaction with $5 expenditure, with total gross sales of $20.	0.60%	1.00%	1.40%
Quality of technology Technical assistance, wireless signal, etc.	Poor	Excellent	
Customer service Timely resolution of disputes, capacity of solving problems, friendly staff	Poor	Excellent	
Customers			
Vendors are local farmers	Not at all	All of them	
Quality of food sold	Poor	Excellent	
Atmosphere	Not entertaining	Very entertaining	
Price For a bundle of goods including 1 lb. of apples, 1 head of romaine lettuce, 1 lb. of tomatoes, 4.4 oz. of berries, 1 lb. onions.	$8.00	$8.75	$9.50

Sample Market Managers Survey

Please mark with an "X" the option (JUST ONE) that you would choose given these three alternatives.

	Option 1	Option 2	Option 3
COSTS *(Includes cost of the machine, extra battery, carrying case, case of paper, encryption programming fee, payment card industry (PC) fee, statement fee (for an entire season), wireless network (for an entire season).*	$875	$775	
CREDIT CARD FEES *(Percentage of dollar amount per transaction)*	1.69%	1.74%	
DEBIT CARD FEES *(Including PIN fees) (Percentage of dollar amount per transaction)*	1.4%	1.9%	No Credit/Debit or /EBT machines
EBT FEES *(Dollars per transaction)*	$0.09	$0.34	
EQUIPMENT QUALITY *(Includes wireless signal)*	Poor	Excellent	
CUSTOMER SERVICE *(Timely resolution of disputes; Capacity of solving problems; Friendly staff)*	Poor	Excellent	
EASE OF USE	Not User Friendly	Not User Friendly	
	I would choose	I would choose	I would choose

Figure 1. Example of a choice scenario used in the market managers' survey

Methods

Discrete choice experiments are a form of conjoint analysis used to determine the relative importance of various product attributes in consumers' choice processes (Louviere et al. 2001, Adamowicz et al. 1998). This approach assumes that consumers derive utility from a product's attributes rather than the good itself (Lancaster 1966) and is consistent with the random utility model (Ben-Akiva and Lerman 1985). In this study, the decision-making of farmers' market managers, vendors, and customers were framed into the random utility model. This model assumes that managers and vendors derived a benefit from having electronic payment machines at the market and that customers benefit from shopping at farmers markets. Managers, vendors,

and customers were presented with several alternatives associated with electronic payment machines and farmers markets features. They chose the alternative that provided them the greatest benefit. This benefit was the present value of all the elements that managers, vendors, and customers consider when making their respective choices according to their preferences or utility.

Estimation

Assume the utility that managers, vendors, and customers derive from choosing option *j* is given by,[4]

$$(1)\quad U_{ij} = V_{ij} + \varepsilon_{ij},$$

where $V_{ij}$and $\varepsilon_{ij}$are, respectively, the deterministic and stochastic portion of utility. Note V_{ij} is determined by respondents *i* and attribute levels of option *j*. In our case, j = 1, 2, or 3. The probability that decision maker *i* will choose option *j* is given by,

$$(2)\quad \text{Prob}\{\text{alternative } j\} = \text{Prob}\begin{Bmatrix} V_{ij} + \varepsilon_{ij} \geq V_{ik} + \varepsilon_{ik}\,;\ \forall\, k \in C = \\ \{\text{alternative 1, 2, or 3}\} \end{Bmatrix}$$

If we assume that ε_{ij} is independently and identically distributed over the *j* alternatives and *N* decision makers and follows a standard type-I extreme value distribution, we can rewrite equation (2) as,

$$(3)\quad \text{Prob}\{\text{alternative } j\} = \frac{e^{V_{ij}}}{\sum_{k \in C} e^{V_{ik}}}$$

Equation 3 describes a conditional logit model, which assumes that the independence from irrelevant alternatives (IIA) axiom holds. Results for a Hausman test suggest that the IIA axiom holds for managers and vendors, but not for customers[5]. Likelihood ratio tests to evaluate for heteroscedascity were conducted for the managers' and vendors' models, resulting in no evidence of heteroscedascity. Hence, managers and vendors' model parameters were estimated using the conditional logit and the customers' model parameters were estimated via mixed logit.

Characteristics of individuals' responding to the discrete choice scenarios were included in all three models. We followed a similar rationale as in Train and Atherton (1995), Revelt and Train (1998) and Hoyos et al.. (2009). In our case, all possible variables collected in our surveys, were evaluated for inclusion. To select the individual specific variable that would yield the outperforming model, we used the following criteria: reasonable willingness-to-pay estimates

[4] In equations 1–3, all three groups (managers, vendors, and customers) are identified with *i*, and alternatives presented to all three groups are identified with *j*. Equations 4–6 have different subscripts for each group.

[5] The Hausman test for managers yielded χ^2=1.96, p-value=0.98; for vendors χ^2=0, p-value=1; and for customers χ^2=50.73, p-value=3.35×10^{-9}. We failed to reject the null hypothesis that IIA holds for managers and vendors, but reject for customers. The likelihood ratio test for managers resulted χ^2=0.232, p-value=0.89; for vendors χ^2=3.558, p-value=0.169. We failed to reject the null hypothesis that homoscedascity holds for managers and vendors.

(Louviere et al.. 2005, Hensher 2006, Hoyos 2009) [6] and measures of goodness of fit including the Akaike information criterion (AIC), the Bayes information criterion (BIC), and the likelihood ratio index. We conducted three regressions for each group of respondents (e.g., managers, vendors, and customers), one not including respondents' characteristics, and the other two with the highest performing models including such characteristics.

For the managers, the two respondents' characteristics selected were number of vendors in the market and the years managing the market.

The deterministic portion of the utility model for managers is given by,

$$(4)\ V_{mp} = \propto_3 + \beta_{1m}(Credit\ card\ fees)_{mp} + \beta_{2m}(Debit\ card\ fees)_{mp} + \beta_{3m}(EBT\ fees)_{mp} + \beta_{4m}(Customer\ service)_{mp} + \beta_{5m}(Quality\ of\ technology)_{mp} + \beta_{6m}(Ease\ of\ use)_{mp} + \beta_{7m}(Costs \times manager/marketcharacteristic_a)_{mp},$$

where V_{mp} is the indirect utility that manager *m* gets when choosing alternative *p*; $\propto_3$ is the alternative specific constant (hereafter ASC) for the none option, given that we are dealing with un-labeled choice options; β_{1m} through β_{7m} are the parameters to estimate and represent the marginal utility of each variable in the model; *credit card fees* is the percentage of the dollar amount of one credit card transaction; *debit card fees* is the percentage of the dollar amount of one debit card transaction, including PIN fees; *EBT fees* is the amount of money per EBT transaction; *ease of use* is a binary variable that equals 1 if equipment is user friendly and 0 otherwise; *quality of technology* is a binary variable that equals 1 if machine provider excels in technical assistance and the wireless signal is reliable and 0 otherwise; *customer service* is a binary variable that equals 1 if machine provider customer service is outstanding in terms of timely resolution of disputes, capacity of solving problems, and friendly staff and 0 otherwise; and *costs* is the wireless machine prices, including the machine itself, extra battery, carrying case, case of paper, encryption programming fee, payment card industry fee for an entire season, and wireless network for an entire season; $manager/market\ characteristic_a$ is the specific characteristic of the manager/market, *a*=number of vendors and years managing the market. Note that *a*=1 if none characteristic was included in the model.

For the vendors' model, the deterministic portion of the utility is given by,

$$(5)\ V_{vq} = \gamma_3 + \beta_{1v}(Customer\ service \times vendor\ characteristic_b)_{vq} + \beta_{2v}(Quality\ of\ technology \times vendor\ characteristic_b)_{vq} + \beta_{3v}(fees \times vendor\ characteristic_b)_{vq},$$

[6] Louviere et al. (2005), Hensher (2006), and Hoyos (2009) discussed the use of different distributions of random parameters when estimating discrete choice models. They concluded that although there were distributions that could lead to a better fit, it would be at the expense of less realistic WTP distributions, thus they favor the specification of distributions leading to more reasonable WTP estimates.

where V_{vq} is the indirect utility vendor *v* gets when choosing alternative *q*; γ_3 is the ASC for the none option; β_{1v} through β_{3v} are the parameters that estimate and represent the marginal utility of each variable included in the model; *customer service* is a binary variable that equals 1 if machine provider customer service is outstanding in terms of timely resolution of disputes, capacity of solving problems, and friendly staff and 0 otherwise; $vendor\ characteristic_b$ is the specific characteristic of the vendor, *b*= daily stall fee, number of farmers markets where vendors sell their products (*b*=1 if no vendor characteristic was included in the model); *quality of technology* is a binary variable that equals 1 if machine provider excels in technical assistance and that the wireless signal is reliable and 0 otherwise; and *fees* are the percentage of the dollar amount spent in four transactions: credit, debit card, debit using a PIN, and EBT.

For the customers' model, the characteristic specific to the respondent was the number of years shopping at the farmers market. Similar to the vendors' model, we interacted the attributes of farmers markets with number of years customers' have shopped at farmers' markets.

The customers' deterministic portion of the utility is given by,

$$(6)\ V_{cr} = \delta_3 + \beta_{1c}(Local\ farmers \times customer\ characteristic_h)_{cr} + \beta_{2c}(Quality\ of\ food \times customer\ characteristic_h)_{cr} + \beta_{3c}(Amostphere \times customer\ characteristic_h)_{cr} + \beta_{4c}(Electronic\ payment\ card \times customer\ characteristic_h)_{cr} + \beta_{5c}(Price)_{cr},$$

where V_{cr} is the indirect utility customer *c* gets when choosing alternative *r*; δ_3 is the ASC for the none option; β_{1c} through β_{5c} are the parameters to estimate and represent the marginal utility of each variable included in the model; *local farmers* is a binary variable that equals 1 if market vendors are local and 0 otherwise; $customer\ characteristic_h$ is the characteristic specific to the customer *h*=shopping frequency, years shopping at farmers' markets, (note that h=1 if none customer characteristic was included in the model); *quality of food* is a binary variable that equals 1 if quality of food sold at market is of excellent quality and 0 otherwise; *atmosphere* is a binary variable that equals 1 if the market atmosphere is entertaining and 0 otherwise; *electronic payment card* is a binary variable that equals 1 if the market is provided with electronic payment machines and 0 otherwise; and *price* is the price paid by customers for a bundle of goods. Parameter estimates for all three models were calculated using SAS©[7].

The managers' willingness-to-pay (WTP) for electronic payment machine features is obtained by,

$$(7)\ WTP_k = -\frac{\beta_{km}}{\beta_{7m}},$$

where WTP_k is the WTP for the electronic payment machine feature *k* (including credit, debit, and EBT fee; ease of use; quality of the technology; and customer service), β_k is the parameter estimate for electronic payment machine feature *k*, and $\beta_{7m}$is the parameter estimate for the cost

[7] We recognize that a limitation of our coefficients' estimation is the use of PROC MDC in SAS©, a procedure that does not provide options to specify repeated choices made by the same individual.

of the electronic payment machine to the market's manager. Similar estimations are made for vendors' WTP for machine features. Coefficients used were customer service, quality of the technology, and fees. For customers, the WTP for market features is given by,

$$(8)\quad \mathrm{WTP}_{\mathrm{l}} = -\frac{\beta_{\mathrm{lc}}}{\beta_{\mathrm{5c}}},$$

where WTP_l is the WTP for market feature l, including local farmers, quality of the food, atmosphere, and access to electronic payment machines at the market; β_l is the parameter estimate for market features; and $\beta_{5c}$is the parameter estimate for the price of a bundle of goods in the market. The standard deviation for each WTP was estimated by parametric bootstrapping (Krinsky and Robb 1986).

Results

Summary Statistics

Fifty eight percent (7 of 12) of farmers' market managers interviewed were somewhat familiar with the use of electronic payment machines in the market, as they had been using it for at least two years. Fifty percent of respondents stated that they would continue participating in programs that facilitate access to electronic payment machines at markets and 50% said that they would use market funds to procure this technology (Table 2). These results do not provide a conclusive evidence of managers favoring the use of the technology in the market, under the context of the 2011 Washington farmers market pilot program. It might be that the additional task of having to run the centrally located machine and keeping records of transactions might deter them for favoring the technology. In addition, novel competing technologies have emerged, as for example the Square® for smartphones that has the potential to offer enhanced convenience for both managers and vendors at a reasonable cost. Markets had on average 16 years in operation, with 48 stalls, 52 vendors, and 1,912 customers on a typical day (Table 2). In 2006, the national average for years in operation was 15 years. Comparing these results with the Far West (which includes the State of Washington) one can claim that our sample of managers was representative of the region. For the Far West, the average number of vendors was 51 and the average number of customers per week, was 1,379 (U.S. Department of Agriculture, Agricultural Marketing Service 2009).

Of vendors surveyed, 38% indicated that their largest market (in terms of sales for the 2010 season) had electronic payment machines, and 35% observed an increase in sales resulting from the use of electronic payment machines (Table 3). On average, vendors traveled 38 miles to reach their largest market (in terms of dollar sales in 2010), the market opened 24 weeks a year (mostly from May to October), the daily stall fee was $41, and have 7 years selling at the market. Vendors surveyed were predominantly Caucasian (75%), had at least some college degree (67%) and were 44 years old. Our sample is somewhat comparable to the national level, where vendors across the U.S. traveled on average 26 miles to sell at their markets and 90% were Caucasian (U.S. Department of Agriculture, Agricultural Marketing Service 2009).

Table 2. 2011 Farmers markets survey, managers' summary statistics.

Features	Number of Markets (N=12)	Mean	Std. dev.	Min.	Max.
Use of electronic payment machines					
Capacity to accept electronic payment cards	7.00				
Procured/subsidized the machines through pilot program	6.00				
Would continue participating in similar projects	6.00				
About the market					
Years of operation		15.54	8.66	3.00	32.00
Stalls in the market		47.36	18.52	22.00	75.00
Vendors in the market		52.00	20.87	22.00	100.00
Shoppers in a typical day		1911.55	1442.45	100.00	4750.00
Distribution of vendor categories in the market					
Farmers	19.00				
Farmer processors	5.00				
Resellers	0.25				
Prepared food vendors	4.00				
Artisan crafters	9.00				
Product assortment across markets					
Fresh fruits	12.00				
Plants, nursery	12.00				
Prepared foods	12.00				
Processed food products	12.00				
Fresh vegetables	12.00				
Coffee	11.00				
Cut flowers	11.00				
Baked goods	10.00				
Cheese, dairy	10.00				
Eggs	10.00				
Meat	10.00				
Fish, seafood	6.00				
Other types of products	6.00				
Wine, cider	3.00				
Managers' information					
Years of experience managing the market	4.00	3.95	4.64	1.00	18.00
Managers with at least some college education	10.00				
Age		47.73	10.05	34.00	65.00
Caucasian	12.00				

Table 3. 2011 Farmers markets survey, vendors' summary statistics.[1]

Features	Number of Vendors (N=48)	Mean	Std. Dev.	Min.	Max.
Use of electronic payment machines					
Yes	18.00				
No	22.00				
Don't know	8.00				
Vendors' category in the market					
Farmers	48.00				
Farmer processors	3.00				
Resellers	4.00				
Prepared food vendors	1.00				
Artisan crafters	2.00				
Product category					
Distribution of products					
Fresh vegetables	41.00				
Fresh fruits	29.00				
Plants, nursery	19.00				
Cut flowers	13.00				
Eggs	4.00				
Grain flour	3.00				
Meat	3.00				
Prepared foods	2.00				
Processed food products	2.00				
Fish, seafood	1.00				
About the vendor					
Number of weeks market is open during the year		23.56	7.57	8.00	52.00
Miles traveled to reach market		38.30	52.77	15.00	255.00
Daily stall fee		41.06	38.25	15.00	200.00
Years selling products at market		6.63	6.22	1.00	24.00
Number of markets where products are sold		2.96	2.40	1.00	10.00
Number of vendors with some college education	32.00				
Age		44.21	13.99	19.00	68.00
Number of vendors who are Caucasian	36.00				

Note. [1] This survey refers to the market where the vendor obtained the largest sales in terms of dollars for 2010.

Only 29% of customers interviewed had used some form of credit, debit, or EBT payment when making purchases at a farmers' market, and 42% would buy more now that they were aware that they could use electronic payment cards at the farmers' market (Table 4). Only 4% found using electronic payment machines to be challenging, but no specific challenges were noted. Top purchases among customers interviewed were fresh vegetables, fresh fruits, prepared foods, baked goods, cheese, dairy, and coffee. This was consonant with results of a 2010 dot survey in Washington D.C. where the top three products that customers reported purchasing were fresh fruits and vegetables, baked goods, and prepared foods (Ragland 2011). Customers' primary reason for buying at farmers markets was to support local farmers, followed by increased access to healthy, environmentally friendly, and tasty food. Also, this is in agreement with the 2006 National farmers markets survey where markets' managers were interviewed and they

considered freshness, taste and access to local food as the three top reasons customers shopped at farmers markets ((U.S. Department of Agriculture, Agricultural Marketing Service 2009).

Table 4. 2011 Farmers markets survey, customers' summary statistics.

Features	Number of Customers (N=96)	Mean	Std. Dev.	Min.	Max.
Use of electronic payment cards					
Use credit/debit or EBT	29.00				
Do not use credit debit or EBT	67.00				
Planning to buy more with credit/debit/EBT	42.00				
Product category bought					
Fresh vegetables	70.00				
Fresh fruits	62.00				
Prepared foods	59.00				
Baked goods	33.00				
Cheese, dairy	19.00				
Coffee	19.00				
Cut flowers	14.00				
Processed food products	13.00				
Meat	12.00				
Eggs	9.00				
Plants, nursery	7.00				
Fish, seafood	5.00				
Wine, cider	5.00				
Grain, flour	2.00				
Primary reason for shopping at farmers markets					
Support a local farmer	48.00				
Healthy food	40.00				
Environmentally friendly food	22.00				
Tasty food	19.00				
Atmosphere	16.00				
Seeing friends	13.00				
Use credit/debit card & EBT	8.00				
Affordable food	5.00				
Crafts	4.00				
Prepared foods	3.00				
About customer					
Amount spent or planned to spend		21.65	15.14	0.00	100.00
Shopping frequency (0=this is my first visit, 5=weekly)		3.84	1.51	0.00	5.00
Years shopping at farmers markets		7.71	6.69	0.00	30.00
Customers with at least some college education	73.00				
Age		47.15	17.05	18.00	85.00
Number of customers who are Caucasian	78.00				

Customers interviewed that they spent or planned to spend $22 on average, with a shopping frequency of twice a month. They were on average 47 years old, 78% were Caucasian, and 73%

had at least some college education. Our sample is representative of farmers markets customers across the U.S. For example, Ragland et al. (2011) reported that 52% of farmers markets' customers interviewed in Washington D.C. usually spent $20 per market visit. Our sample is comparable to Elepu and Mazzocco (2010) who surveyed 508 consumers in six farmers markets in Illinois, and found that in general consumers were 47 years old, 83% were Caucasian, and 94% had at least some college education. In Gumirakiza et al. (2014), who interviewed 1,488 farmers markets customers in Utah and Nevada, customers' average age was 42 and shopping frequency was approximately once a month (4-7 times per season).

Discrete Choice Experiment Results

Table 5 depicts results from three managers' models, with and with no inclusion of managers' characteristics.

Table 5. Parameter estimates for the conditional logit model depicting farmers markets managers' preferences for having electronic payment card machines at their market.

Variables	**Model 1** No inclusion of managers' characteristics	**Model 2** Including # vendors in the farmers market	**Model 3** Including years managing farmers market
ASC - none option	0.361	1.358	3.383
	(6.414)1	(6.308)	(6.133)
Credit card fees	-1.102	-1.875	-1.401
	(5.890)	(5.765)	(5.678)
Debit card fees	-4.326**2	4.709**	-3.884**
	(1.847)	(1.856)	(1.750)
EBT fees	-0.863**	-0.945**	- 0.807**
	(0.379)	(0.390)	(0.374)
Quality of technology	4.336***	4.689***	4.163***
	(0.927)	(0.966)	(0.916)
Customer service	2.928***	2.711***	2.803***
	(0.674)	(0.674)	(0.676)
Ease of use	3.126***	2.968***	2.745***
	(0.778)	(0.795)	(0.756)
Cost	-3.968***	--	--
	(1.502)	--	--
Cost x # vendors in the farmers market	--	-0.033***	--
	--	(0.011)	--
Cost x years managing the farmers market	--	--	-0.118**
	--	--	(0.052)
Number of observations	110.000	110.000	110.000
Log likelihood	-78.130	-77.089	-79.089
Akaike information criterion	172.260	170.178	174.179
Bayes information criterion	193.864	191.782	195.783
Pseudo R-square	0.354	0.362	0.346

Notes. [1] Numbers in parenthesis are standard errors. [2]*,**,*** indicates statistically significant at the 1%, 0.05%, and 0.01% levels, respectively.

Across all three models, debit and EBT card fees were negative and statistically significant indicating that these fees would have a negative impact on the probability that managers choose to have electronic payment machines in the market. Credit card fee was not statistically significant. One would expect that credit card fees had an impact on the managers' probability of choosing electronic payment cards, however this was not reflected in our results. Recall that during the 2011 Washington farmers market pilot program 57% of all transactions using electronic payment machines were with credit cards (compared to 32% with debit and 11% with EBT). Improved quality of the technology, customer service, and ease of use had a positive and statistically significant effect on the probability of choosing electronic payment machines in the market. In the context of this study, with one centralized machine at the managers' booth, it was expected that improvements in the quality of technology, customer service and ease of use would imply less time resources (e.g., timely payment to vendors, time devoted in each transaction, staff time in each transaction or solving malfunctions, and so on) invested in having electronic payment machines at the market. The cost of the machine was negative and statistically significant across three models. The scale of the cost coefficient was different when including respondents characteristics and not. This signals that managers with more vendors in the market and with more years managing the market tended to be less concerned with the cost of the machine. The outperforming model was the one including the number of vendors in the farmers market. This model yielded willingness-to-pay estimates consonant with the machine costs in the choice scenarios, and superior measures of goodness of fit compared with the other two models.

For vendors, three models were estimated with and with no inclusion of vendors' characteristics (Table 6). Only the model with no inclusion of vendors' characteristics, displayed a statistically significant and positive ASC for the none option. This signals that vendors would be better off with no electronic payment cards in the markets. Walters (2012) explained that electronic payment machines might not be a good fit for every farmer vendor. She mentioned it was possible that vendors selling at multiple markets each week, selling at large urban markets, selling year round, selling higher priced items, having on the farm sales might not favor this technology. Although the reason why these types of vendors would not favor the technology was not explicit in the text, we assume it was because the extra time transactions with the electronic payment card involves and the delay in receiving reimbursements when compared to cash. In fact, some vendors interviewed in this study, commented that the centrally located wireless machine was convenient for them, as they did not have sufficient staff capacity at their booth, or the financial resources to access the technology by themselves. Across the three models, improvements in the quality of the technology and customer service had a positive effect on the probability of choosing to have electronic payment machines in the market. Improvements in the quality of the electronic payment machine implied flawless transactions and satisfied customers who might be willing to repeat the experience. An improved customer service (from the electronic payment machine provider) was associated with efficient resolution of potential disputes and timely payments. An increase in the fees charged for transactions negatively impacted the probability of having these machines. The outperforming model was the one including the number of markets where vendors sold products. This model yielded willingness-to-pay estimates consonant with percentage fees in the choice scenarios, in comparison to the model not including vendors' characteristics. Also, this model (the outperforming one) yielded superior measures of goodness of fit compared to model including the daily stall fee paid by vendors (Table 6).

Table 6. Parameter estimates for the conditional logit model depicting farmers markets vendors' preferences for having electronic payment card machines at their market.

Variables	**Model 1** No inclusion of vendors' characteristics	**Model 2** Including daily stall fee	**Model 3** Including # markets where vendors sell products
ASC - none option	3.006***[1]	-0.219	0.215
	(0.400)[2]	(0.158)	(0.158)
Quality of technology	1.420***	--	--
	(0.143)	--	--
Customer service	1.755***	--	--
	(0.153)	--	--
Fees	-1.152***	--	--
	(0.194)	--	--
Quality of technology x daily stall fee	--	0.013***	--
	--	(0.003)	--
Customer service x daily stall fee	--	0.021***	--
	--	(0.003)	--
Fees x daily stall fee	--	-0.036***	--
	--	(0.004)	--
Quality of tech. x # markets where vendors sell	--	--	0.237***
	--	--	(0.037)
Customer serv. x # markets where vendors sell	--	--	0.344***
	--	--	(0.045)
Fees x # markets where vendors sell	--	--	-0.480***
	--	--	(0.060)
Log likelihood	-446.126	-524.962	-495.310
Akaike information criterion	900.251	1058.000	998.630
Bayes information criterion	917.676	1075.000	1016.000
Pseudo R-square	0.295	0.170	0.220

Notes. [1]*,**,*** indicates statistically significant at the 1%, 0.05%, and 0.01% levels, respectively. [2] Numbers in parenthesis are standard errors.

For customers, three models were estimated including and not including customers' characteristics associated with farmers markets (Table 7). Note that none of the variables was statistically significant in the model including shopping frequency (Model 2). The ASC for the none option was statistically significant and positive when not including customers' characteristics (Model 1) and statistically significant and negative when including the number of years customer was shopping at farmers markets (Model 3). This implied that with more years shopping at farmers' markets, customers showed a preference for shopping at this type of market compared to other type of outlets. The quality of the food sold, vendors being local farmers, and entertaining market atmosphere had a statistically significant and positive effect on the probability that consumers chose to shop at a farmers market. This outcome was consistent with the reasons customers gave for shopping at farmers markets (Ragland et al. 2011; U.S. Department of Agriculture, Agricultural Marketing Service, 2009). The ability to use an electronic payment card resulted statistically significant and positive in Model 1 (not including

customers' characteristics) but not statistically significant in Model 3 (including number of years customers shopped at farmers' markets). Even more, the standard deviation coefficient for electronic payment card resulted statistically significant and positive signaling heterogeneous preferences across respondents. Customers with more years shopping at farmers markets were not willing to pay premium prices in order to have access to the technology. The price coefficients were statistically significant and negative indicating that higher prices would affect the probability that costumers' shop at farmers markets. The outperforming model was the one including the number of years customers have shopped at farmers markets. The outperforming model yielded WTP estimates comparable to prices in the choice scenarios compared to the model not including customers' characteristics. It also exhibited superior goodness of fit compared to the model including shopping frequency (Table 7).

Table 8 lists managers and vendors' WTP for electronic payment machines' features and customers' WTP for farmers' market features. Managers were willing to discount $143/machine for a one percent increase in debit card fees, and $29/machine for a dollar increase in EBT fees. Conversely managers were willing to pay $90, $82, and $142/machine for having a user- friendly machine, excellent customer service, and excellent quality of the machine technology, respectively. To provide context, recall that the cost of machines in this study ranged from $675-$875. Results reveal that electronic payment machine providers might consider lowering their debit card fees and providing excellent quality machines to attract farmers markets' managers as clients.

Vendors were willing to pay an equivalent to 0.72% ($0.14) fee per $20 transaction for having excellent customer service and 0.49% ($0.10) fee per $20 transaction for having excellent machine quality technology. Recall fees in the choice experiment ranged from 0.6% ($0.12) to 1.4% ($0.28) per $20 transaction. A poor customer service might indicate that markets could experience delays in resolution of potential disputes and vendors would not be reimbursed on time. The quality of the technology might affect vendors realizing a sale. If the machine was not working properly customers might have been discouraged of buying at the market. Electronic payment machine providers seeking to attract farmers markets' vendors (under the context of this study) as clients must consider excelling in customer service and quality of the machine technology.

Customers were willing to pay price premiums equivalent to $4, $3, and $2/bundle of goods for having an excellent quality food offered, for vendors being local farmers, and for an entertaining atmosphere, respectively. Prices in the choice experiment scenarios ranged from $8-$9.5/bundle of goods. As of 2011, customers were not willing to pay premium prices to access electronic payment machines. This implies that a strategy consisting of charging premium prices might not be the best way of financing the electronic payment machines, as customers were not willing to pay additional for accessing them. However, 70% of customers surveyed did not use an electronic payment card when shopping at farmers markets during 2010, which indicates that it might take time for customers to get use to the technology, realize its convenience, and be willing to pay price premiums for it. Also, that 42% of surveyed individuals indicated they would buy more knowing that these machines were available in the market, signals the need to increase awareness among customers.

Table 7. Parameter estimates for the mixed logit model depicting customers' preferences for farmers markets' features including the use of electronic payment card machines.

Variables	**Model 1** No inclusion of respondents' characteristics		**Model 2** Including shopping frequency		**Model 3** Including years shopping at farmers' markets	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
ASC – none option	7.069***[1]	--	-1.438	--	-4.020***	--
	(1.802)[2]		(1.002)		(0.934)	
Vendors are local farmers	2.191***	0.067	--	--	--	--
	(0.290)	(1.813)				
Quality of food sold	2.732***	0.766*	--	--	--	--
	0.328)	(0.442)				
Entertaining atmosphere	0.875*	0.122	--	--	--	--
	(0.509)	(2.449)				
Use electronic payment card	1.218***	1.135***	--	--	--	--
	(0.239)	(0.422)				
Price	-0.133	--	--	--	--	--
	(0.150)					
Vendors are local farmers x shopping frequency	--	--	4.398	1.987	--	--
			(8.048)	(3.640)		
Quality of food sold x shopping frequency	--	--	6.215	5.889	--	--
			(11.347)	(10.702)		
Entertaining atmosphere x shopping frequency	--	--	2.539	1.894	--	--
			(4.775)	(3.426)		
Use electronic payment card x shopping frequency	--	--	1.617	6.551	--	--
			(3.055)	(12.114)		
Price x shopping frequency	--	--	-0.900		--	--
			(1.588)			
Vendors are local farmers x years shopping at farmers' markets	--	--	--	--	1.271***	0.276
					(0.490)	(0.2588)
Quality of food sold x years shopping at farmers' markets	--	--	--	--	1.664***	1.381**
					(0.640)	(0.560)
Entertaining atmosphere x years shopping at farmers' markets	--	--	--	--	0.769*	1.101**
					(0.442)	(0.558)
Use electronic payment card x years shopping at farmers' markets	--	--	--	--	0.256	1.530**
					(0.186)	(0.632)
Price x years shopping at farmers' markets	--	--	--	--	-0.413***	
					(0.138)	
Number of observations	665.000		665.000		665.000	
Log likelihood	-395.025		-425.688		-416.97	
Akaike information criterion	810.049		871.377		853.939	
Bayes information criterion	855.047		916.375		898.937	
Pseudo R-square	0.459		0.417		0.429	

Notes. [1]*,**,*** indicates statistically significant at the 1%, 0.05%, and 0.01% levels, respectively. [2] Numbers in parenthesis are standard errors.

Table 8. Farmers markets managers', vendors', and customers' willingness-to-pay (WTP) for electronic payment cards' features.

Features	Managers[1] ($/machine)	Vendors[2] (% fee/4 transactions)	Customers[3] ($/bundle of goods)
Increase in credit card fees	-56.809	--	--
	(60.777)[4]		
Increase in debit card fees	-142.682**[5]	--	--
	(325.287)		
Increase in EBT fees	-28.648**	--	--
	(95.422)		
Ease of use	89.930***	--	--
	(291.063)		
Customer service	82.142***	0.716***	--
	(225.578)	(0.092)	
Quality of electronic payment card technology	142.076***	0.493***	--
	(333.629)	(0.075)	
Quality of food sold at farmers' market	--	--	4.026***
			(2.510)
Vendors are local farmers	--	--	3.076***
			(2.050)
Entertaining atmosphere at the farmers market	--	--	1.861*
			(2.718)
Ability to use electronic payment card	--	--	0.618
			(1.527)

Notes. [1] Using coefficients from model that included number of vendors in the farmers market. [2] Using coefficients from model that included number of markets where vendors sell products. [3] Using coefficients from model that included the years shopping at farmers markets. [4] Numbers in parenthesis are standard deviations calculated via parametric bootstrapping. [5] *,**,*** indicates statistically significant at the 1%, 0.05%, and 0.01% levels, respectively.

Conclusions

Enabling electronic payment machines at farmers markets represents an opportunity for vendors to increase sales and expand their customer base. In this study, we estimated the economic value managers and vendors posit on different machine features. We also calculated the value customers posit on farmers markets features including access to electronic payment machines.

In a context where there is one centrally located machine per market at the manager's booth, managers appear to value the quality of the machine technology ($142/machine), ease of use ($90/machine), and the provider's customer service ($82/machine). Managers seemed to be concerned with increases in debit and EBT card fees, as they were willing to discount $143 and $28/machine, respectively. Our results signal that individuals managing larger markets (in terms of the number of vendors) and with more years managing the market would be less concerned with the cost of the machine. Those willing to spread the implementation of electronic payment machines at farmers markets might prioritize working with larger-scale and experienced

managers. Farmers markets' vendors were willing to pay 0.72%, and 0.49% in fees for an excellent provider's customer service and excellent quality of the machine technology. With one centralized machine located at managers' booth, vendors valued a timely resolution of potential disputes hence timely reimbursement, and customers pleased with the machine transaction process and willing to repeat the experience. Electronic payment machine providers seeking to work with farmers markets and gain vendors' approval must consider excelling in customer service and quality of their technology. Farmers markets' customers valued accessing to excellent quality of food ($4/bundle of goods), farmers being local ($3/bundle of goods), and entertaining atmosphere ($2/bundle of goods). Customers were not willing to pay premium prices for having access to electronic payment machines at farmers markets. The fact that 70% of the customers surveyed did not use these machines in 2010, and that 42% indicated they would buy more knowing that these machines were available in the market, signals the need to increase awareness among customers.

Enabling the use of electronic payment machines at farmers markets is a promising way to increase sales and expand customer base. That our findings do not signal an overwhelming acceptance of this technology from managers, vendors, and customers might reflect the early stages of implementation and the limited awareness of all benefits to be realized. With the appearance of competing ways of implementing electronic payment machines (e.g., Square®) managers and vendors must carefully analyze benefits and costs of having access to this technology. A centralized electronic payment location might appear attractive to small vendors with staff limitations and who cannot afford the technology by themselves. However, they would have less control on the reimbursement timing. This study was focused on Washington State farmers' markets, but similar programs are in place in other States, and market managers and advocates could benefit from the results of this investigation by prioritizing on markets more likely to adopt, by establishing relationships with electronic payment machine providers excelling in services more valued by managers and vendors, and by increasing awareness across customers on the accessibility to electronic payment terminals at farmers markets.

Acknowledgment

This study was funded by the Washington State Department of Agriculture Specialty Crop Block Grant Program, "Increasing High-Value, Specialty and Sustainable Crop Sales through Farmers markets: Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability 2010-1013."

References

Archer, G.P., J. García Sánchez, G. Vignali, and A. Chaillot. 2003. Latent Consumers' Attitude to Farmers Markets in North West England. *British Food Journal* 105(8): 487-497.

Adamowicz, W., P. Boxall, M. Williams, and J. Louviere. 1998. Stated Preference Approaches for Measuring Passive Use Values: Choice Experiments and Contingent Valuation. *American Journal of Agricultural Economics* 80(1): 64-75.

Ben-Akiva, M. and S. R. Lerman. 1985. *Discrete Choice Analysis: Theory and Application to Travel Demand*. Cambridge, MA: MIT Press.

Brown, C., and S. Miller. 2008. The Impacts of Local Markets: A Review of Research on Farmers markets and Community Supported Agriculture (CSA). *American Journal of Agricultural Economics* 90(5): 1296-1302.

Carpio, C., and O. Isengildina-Massa. 2009. Consumer Willingness to Pay for Locally Grown Products: The Case of South Carolina. *Agribusiness* 25(3): 412–426.

Conner, D., K. Colasanti, R. B. Ross, and S. B. Smalley. 2010. Locally Grown Foods and Farmers markets: Consumer Attitudes and Behaviours. *Sustainability* 2(3): 742–756.

Detre, J., T. B. Mark, A. M. Mishra, and A. Adhiraki. 2011. Linkage between Direct Marketing and Farm Income: A Double-Hurdle Approach. *Agribusiness* 27(1): 19–33.

Elepu, G., and M.A. Mazzocco. 2010. Consumer Segments in Urban and Suburban Farmers Markets. *International Food and Agribusiness Management Review* 13(2): 1-18.

Feagan, R., D. Morris, and K. Krug. 2004. Niagara Region Farmers Markets: Local Food Systems and Sustainability Considerations. *Local Environment: The International Journal of Justice and Sustainability* 9(3): 235-254.

Govindasamy, R., J. Italia, and D. Thatch. 2000. Direct Market Retailer Perceptions of State-Sponsored Marketing Programs. *Review of Agricultural Economics* 22(1):77-78.

Greene, W. 2008. Econometric Analysis 6th Ed. New Jersey: Pearson Prentice Hall.

Gumirakiza, J. D., K. R. Curtis, R. Bosworth. 2014. Who Attends Farmers' Markets and Why? Understanding consumers and their motivations. *International Food and Agribusiness Management Review* 17(2): 65-82.

Guthrie, J., A. Guthrie, R. Lawson, A. Cameron. 2006. Farmers Markets: The Small Business Counter-Revolution in Food Production and Retailing. *British Food Journal* 108(7): 560-573.

Hensher, D. A. 2006. The Signs of the Times: Imposing a Globally Signed Condition on Willingness to Pay Distributions. *Transportation* 33: 205-222.

Hoyos, D., P. Mariel, and J. Fernández-Macho. 2009. The Influence of Cultural Identity on the WTP to Protect Natural Resources: Some Empirical Evidence. *Ecological Economics* 68: 2372-2381.

Kirwan, J. 2006. The Interpersonal World of Direct Marketing: Examining the Conventions of quality at U.K. Farmers Markets. *Journal of Rural Studies* 22: 301-312.

Krinsky, I., and A. L. Robb. 1986. On Approximating the Statistical Properties of Elasticities. *The Review of Economics and Statistics* 68: 715-719.

Lancaster, K. 1966. A New Approach to Consumer Theory. *Journal of Political Economy* 74(2):132–57.

Lev, L., and G. Stephenson. 2001. Rapid Assessment of Five Oregon Farmers Markets: Quantitative Results. *Oregon Small Farms Technical Report* Number 3, Oregon State University.

Louviere, J., D. A. Hensher, and J. D. Swait. 2001. Stated Choice Methods Analysis and Application. Cambridge: Cambridge University Press.

Louviere,J., K. Train, M. Ben-Akiva, C. Bhat, D. Brownstone, T. A. Cameron, R. T. Carson, J.R. Deshazo, D. Fiebig, W. Greene, Da. Hensher, D. Waldman. 2005. Recent Progress on Endogeneity in Choice Modeling. *Marketing Letters* 16: 255-265.

Lusk, J. L., and F. B. Norwood. 2005. Effect of Experimental Design on Choice-Based Conjoint Valuation Estimates. *American Journal of Agricultural Economics* 87(3): 771–785.

Lyon, P., V. Collie, E. Kvarnbrink, and A. Colquhoun. 2009. "hopping at the Farmers Market: Consumers and their Perspectives. *Journal of Foodservice* 20:21-30.

McCloskey, D. N. 1985. The Loss Function has Been Mislaid: The Rhetoric of Significance Tests. *The American Economic Review* 75: 201-205.

Miller, S. 2012. Terminals, Tokens, and Time, Oh My! Farmers Markets SNAP Success: What Does It Take? Farmers Markets Coalition. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5083970&acct=frmrdirmkt. [Accessed September 2013.]

Murdoch, J., T. Marsden, and J. Banks. 2000. Quality, Nature, and Embeddedness: Some Theoretical Considerations in the Context of the Food Sector. *Economic Geography*. 76(2): 107–125.

Neil, D.H. 2002. Farmers Markets as Retail Spaces. *International Journal of Retail and Distribution Management* 39(8): 582-597.

Ordóñez, R. 2013. Factsheet for WSDA Specialty Crop Grant 2010-2013 Increasing High-Value Specialty and Sustainable Crop Sales through Farmers Markets: Assessing the Economic Potential of Electronic Benefits Transfer and Credit Card Capability. Small Farms Program, Center for Sustaining Agriculture and Natural Resources, Washington State University.

Ostrom, M. 2006. Everyday Meanings of Local Food: Views from Home and Field. *Journal of the Community Development Society* 37 (1): 65-78.

Pascucci, S., C. Cicatello, S. Franco, B. Pancino, and D. Marino. 2011. Back to the Future? Understanding Change in Food Habits of Farmers Markets Customers. *International Food and Agribusiness Management Review* 14(4): 105-126.

Ragland, E., V. Lakins, and C. Coleman. 2011. Results of Dot Survey: USDA Outdoor Farmers Market, Washington DC. U.S. Department of Agriculture, Agricultural Marketing Service. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5093878. [Accessed September 2013.]

Reardon, T., C. P. Timmer, C. Barrett, and J. Berdegué. 2003. The Rise of Supermarkets in Africa, Asia, and Latin America. *American Journal of Agricultural Economics* 85(5): 1140-1146.

Revelt, D. and K. E. Train. 1998. Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level. *Review of Economics and Statistics* 80(4): 647-657.

Sommer, R., J. Herrick, and T. R. Sommer. 1981. The Behavioral Ecology of Supermarkets and Farmers Markets. *Journal of Environmental Psychology* 1(1): 13-19.

Train, K. E. and T. Atherton. 1995. Rebates, Loans, and Customers' Choice of Appliance Efficiency Level: Combining Stated- and Revealed-Preference Data. *The Energy Journal* 16(1): 55-69.

Trobe, H. 2001. Farmers Markets: Consuming Rural Local Produce. *International Journal for Consumer Studies* 25(3): 181-192.

U.S. Census Bureau. State and County Quick Facts. http://quickfacts.census.gov/qfd/states/53000.html. [Accessed October 2014.]

U.S. Department of Agriculture, Agricultural Marketing Service. 2013. Farmers Market Growth: 1994. http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateS&leftNav=WholesaleandFarmersMarkets&page=WFMFarmersMarketGrowth&description=Farmers%20Market%20Growth. [Accessed September 2013.]

U.S. Department of Agriculture, Agricultural Marketing Service. 2009. National Farmers Market Manager Survey 2006. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5077203&acct=wdmgeninfo. [Accessed September 2013.]

U.S. Department of Agriculture, Food and Nutrition Service. 2014. Supplemental Nutrition Assistance Program Data. http://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap. [Accessed October 2013.]

Varner, T., and D. Otto. 2007. Factors Affecting Sales at Farmers markets: An Iowa Study. *Review of Agricultural Economics* 30(1): 176–189.

Walters, J. 2012. Are Farmers Markets a SNAP? Division of Financial, Health, and Work Supports. Iowa Department of Human Services. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5083972&acct=frmrdirmkt. [Accessed September 2013.]

Washington State Farmers Markets Association. 2013. Farmers Markets in Washington State. http://smallfarms.wsu.edu/wsu-pdfs/WA%20Farmers%20Markets%20April%202013%5B4%5D.pdf. [Accessed May 2013.]

Wasserman, W., D. Topp, V. Lakins, C. Foley, M. DeNinno, J. Thompson, N. Owens, and K. Williams. 2010. Supplemental Nutrition Assistance Program (SNAP) at Farmers markets: A How-To Handbook. A Joint Publication by the Agricultural Marketing Service, Food and Nutrition Service, USDA and Project for Public Spaces, Inc. http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5085298. [Accessed September 2013.]

Zepeda, L., and C. Leviten-Reid. 2004. Consumers' Views on Local Food. *Journal of Food Distribution Research* 35(3): 1–6.

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

Extra-Core Production and Capabilities: Where is the Food Industry Going?

Ting Fa Margherita Chang[a], Maurizio Droli[ⓘb], and Luca Iseppi[c]

[a] *Full Professor, Department of Civil Engineering and Architecture, Section of Economics and Landscape University of Udine, Via delle Scienze, 206, 33100, Udine, Italy*

[b] *Doctoral Candidate, Department of Civil Engineering and Architecture, Section of Economics and Landscape University of Udine, Via delle Scienze, 206, 33100, Udine, Italy*

[c] *Aggregate Professor, Department of Civil Engineering and Architecture, Section of Economics and Landscape University of Udine, Via delle Scienze, 206, 33100, Udine, Italy*

Abstract

Through the lens of resource-based theory, this study examines the extra-core food industry capabilities needed to diversify secondary production (heterogeneity) in order to overcome entry barriers into destination markets (mobility). Using a well-structured database of Eurostat supply tables (EU-27), results demonstrate: a) entering a food core business need not be difficult for newcomers; b) The EU Food Industry has capabilities to undertake extra-core business activities below the average of the EU-27 system; and, c) the food industry's secondary production is too heterogeneous and distributed over a wide range of activities. This study highlights productive trends, hypothesizing capacity needs and creates the necessary framework for further investigation.

Keywords: food industry, secondary productions and markets, resource-based theory, portfolio diversification, capabilities

ⓘCorresponding author: Tel: + 39.0432.558318
Email: T.F.M. Chang: chang@uniud.it
M. Droli: maurizio.droli@uniud.it
L. Iseppi: luca.iseppi@uniud.it

Introduction

In general, industries aim to maintain strong positions in their core business markets while developing other types of new business opportunities as they arise. Extra-core business diversification is largely the result of managerial choice and is performed by adding secondary production to the primary business operations. Secondary production is relatively an under-investigated field of research primarily due to the difficulty of separating the value of primary, from secondary production in each sub-sector. For this reason, evaluations are often limited to specific products, unstructured, un-standardized through homologated classifications, and/or subject to duplications (Kneafsey et al. 2013, 76). In order to enable both managers and scholars to benefit from these studies, it is necessary to start with a complete, standardized, and certified database, without duplication. After extensive research, Eurostat found a solution to this age-old methodological and accounting problem within the framework of the ESA-95 system, and it works well with the UN-System of National Accounts (Eurostat 2008). Over the last five years, Eurostat has also disseminated a new set of input-output tables which they named *Supply and Use*. They are consistent with the NACE and CPA Classifications and are compatible with the UN - ISIC classifications. The supply table (by product and industry) provides the value of main production for each industry, as well as secondary productions that are in the core competences of other industries. It also provides the value of an entire group of homogeneous products (e.g. food products) supplied to the economy as a whole by each industry and broken down by the industries that deliver it as a principal product.

This study analyzes available data under the lens of the resource-based theory – RBT (Penrose 1959, Wernerfelt 1984, Barney 1991, Peteraf 1993, Barney et al. 2011), and of its spin-off, the knowledge-based view – KBV (Grant 1996), focusing on the importance of competitive advantage defensibility (Porter 1980, Porter 1985, Grant 1999, Valdani 2003).

Once a product a competitive advantage is achieved, it should continue to exist, becoming "sustained" despite attempts by others to duplicate it (Barney 1991, Lippman and Rumelt 1982, Rumelt 1984). The organizations should be deployed resources, such as knowledge and 'dynamic capabilities', in a controlled manner to assure the maintenance of heterogeneity and to prevent the increase of mobility to other businesses (Penrose 1959, Grant 1996, Teece et al. 1997). In the context of the RBT, the definition of a firm's strategy requires resources to be both acquired (Combs et al. 2011, Wernerfelt 2011, Maritan and Peteraf 2011, Makadok and Barney 2001), and developed (Sirmon et al. 2011, Zahra et al. 2009, Sun et al. 2010). Market share can represent a resource for the firm, but it does not have a value in itself. This leads to a controversial relationship between a firm's market share and its profits. Market share "is a symptom of valuability, and can become a means of obtaining something valuable." (Wernerfelt 2005, 11).

Presently, there are no outstanding studies which have adopted business-to-business (B2B) market share to map extra-core capabilities for food firms within the RBT. The main objectives of this study are: 1) to quantify the value of activities included in the food industry portfolio that are classified by Eurostat as primary and secondary production which pertain to the core business of other industries. This may reveal the degree of heterogeneity of the food industry; 2) to create a specific Boston Consulting Group (BCG) Growth-Share Matrix in order to verify food industry

choices and expectations regarding its paths of diversification (Henderson 1970), and 3) to evaluate, through the construction of entry barrier and invasion indexes, the difficulties facing the food industry in its attempts to diversify its portfolio. Suggestions about potential opportunities for developing extra-core business activities are outlined taking into account what hinders the mobility of the resources towards extra-core business. This foundation makes it possible to deduce something about how well extra-core capabilities work and determine how much the knowledge existing food firms require to assure competitive survival and support their sustained competitive advantage – especially in the most lucrative extra-core downstream activities representing a "profit imperative" in the manufacturing industry (Wise and Baumgartner 1999, 133).

The study is organized as follows: theoretical approach, materials, methods, and findings. Finally, a discussion and concluding remarks are presented.

Theoretical Approach: Resources, Capabilities, and Mobility Barriers in the Framework of the Knowledge-Based View

In the context of the RBT, the definition of a firm's strategy requires the acquisition and development of specific resources to guarantee competitive survival and to create a sustained competitive advantage. These resources are sub-divided into actual resources—in the strict sense, and capabilities (Makadok 2001, Amit and Schoemaker 1993). The former are stocks of available factors that are owned or controlled by the firm, while the latter are capacities which are necessary to exploit and preserve resources (Amit and Schoemaker 1993, 35). Following the traditional management approach, foresight may enable managers to achieve the firm's goals, seize opportunities and adapt the production to its core and extra-core business (Hamel and Prahalad 1994). Capability is a special type of firm-specific resource (organizational, embedded, and non-transferable) that is utilized to improve the productivity of the other resources possessed by that business (Makadok 2001, 389). The firm's extra-core capabilities may be best defined as organizational resources that can be deployed to create value outside the generating industry. These tangible and intangible resources represent the link that connects firm's strategies, tactics, and technologies to the productivity of its marketing management initiatives. When robust enough and acknowledged, that link may facilitate the horizontal and vertical integration of productive processes downstream towards the final clients.

Following the RBT, not all firm's capabilities can become sources of sustained competitive advantage. In her seminal study, Edith Penrose (1959) underlined that the firms' success in the long term largely depends on the availability of a well-established set of resources. Since then, the RBT scholars have produced conceptual spillovers, such as the 'Knowledge-Based View' – KBV (Grant 1996), and 'dynamic capabilities' (Teece et al. 1997), built respectively on the importance of specific knowledge, and of human resources. For the purpose of this article, Machlup's (1980) definition has been adopted. He individuated the following three groups of elements constituting knowledge: i) being able to explain, demonstrate, talk about, perform; ii) being acquainted with, aware of, familiar with; iii) distinguishing, interpreting, remembering, recollecting, recognizing, and understanding. From this conceptual basis, asymmetry in the economics of knowledge represents one of the main factors explaining the existence of firms (Demsetz 2000), and also one of the main resources needed to create value (Kaplan et al. 2004).

Knowledge within the RBT has been described in terms of its four attributes: 'transferability' (manageability), 'capacity for aggregation' (knowledge added), 'appropriability' (the ability of the knowledge owner to obtain a return equal or superior to the value created by that knowledge), and 'specialization in knowledge acquisition and storage' (Grant 1996, 111-112). This study does not analyze specific extra-core capabilities, but quantifies their key-features in terms of heterogeneity and low-mobility.

Heterogeneity and low-mobility are features of primary importance for the RBT (Barney and Hoskisson 1989). It suggests that both competitive advantage and sustained competitive advantage cannot exist when firm's resources are perfectly homogeneous and/or mobile (Barney 1991, Peteraf 1993). In relation to this, the first research hypothesis of this study is:

H1: It would be reasonable to expect some level of heterogeneity and immobility of resources.

In general, position barriers represent the mechanism that enables a firm to maintain such a form of equilibrium. The first mover advantage may represent the first mechanism to be activated in order to exploit opportunities and create heterogeneity (Lieberman and Montgomery 1988). For example, the first firm which enters into an industrial extra-core business, implementing a strategy ahead of any other competing firm, can gain added capabilities in the sector where it enters that are not yet possessed by other firms. The first mover advantage may be captured because the firm possesses a unique knowledge or foresight (Lieberman and Montgomery 1988). However, if current competitors and potential entrants also possess the same knowledge it is unlikely that they would gain a competitive advantage. The RBT suggests that to remain in the condition of first mover, firms must control access to the added knowledge. Whenever different firms control identical knowledge, none of them may be able to achieve a sustained competitive advantage through the exploitation of this resource.

The second mechanism to enact to be able to achieve a sustained competitive advantage is that of 'entry barriers' (Bain 1956), or, more generally speaking, 'mobility barriers' (Caves and Porter, 1977). To manage the competition, firms need to determine the height of the entry barriers in the destination markets, in order to protect their added knowledge. On the one hand, mobility barriers may help firms in creating and defending the heterogeneity required to achieve competitive advantage, and to generate above-normal economic performance. On the other hand, the existence of mobility barriers becomes possible only if current or potential entrant competitors are heterogeneous in terms of the resources they possess, and/or if these resources are imperfectly mobile (Barney et al. 1989). Consequently, the second research hypothesis is the following:

H2: Entry barriers to the acquisition of extra-core capabilities for food firms are lower than those existing for firms active in other industries.

In short, entry barriers and high mobility barriers may activate heterogeneous capabilities, and may allow a firm to defend its competitive advantage against competitors who do not have the required extra-core capabilities. By verifying these two hypotheses, it will be possible to portray the competition that is created among companies regarding the acquisition of new capabilities (Wernerfelt 2011).

Materials and Methods

This study utilizes the EU-27 Supply matrixes that reflect the primary characterizing (primary output) and secondary non-characterizing (secondary output) production activities of industries. In order to distinguish between the primary and secondary output of an industry, the relationship between industries and products must be defined, based on the criteria of industrial origin. Each product is assigned to one individual industry that, by definition, is the primary producer of that product, thus each industry can be defined by the list of primary products that are attributed to that industry (Eurostat 2008, 18). The share of secondary outputs varies across industries. "Secondary outputs are usually smaller than primary outputs, as units are classified according to their main activity. However, the size of secondary outputs also depends on the level of aggregation, and on the statistical unit used. In the case of enterprises, the secondary output will be much more frequent and higher in its output share than when the information is directly collected from local kind-of-activity units" (Eurostat 2008, 19). Generally, survey results mainly concern enterprises with numerous secondary activities, and it is the principal activity of an enterprise that determines its allocation to a specific industry classification.

The columns of the Supply Matrix present the production program of each industry, including the output of its primary and secondary productions. For each bundle of products listed in the rows (following CPA classifications), it is possible to find the industries that produce those goods as their primary or secondary production listed in the columns. The principal activity or production of an industry is reported on the diagonal of the Supply matrix, while secondary activities are listed off the diagonal (Eurostat 2008, 71).

For the years 2000-2007, the European tables published up to 2012 used the NACE Rev. 1.1 statistical classification of economic activities. Until 2004 the geographical reference was the EU-15 block, and the EU-25 or EU-27 thereafter. Since 2013, the EU national accounts domain as a whole has implemented the NACE Rev. 2 classification (that is harmonized with the United Nations ISIC Rev. 4 classification). The new series of input-output tables (featuring 65 groups of products in the rows, and 65 Industries in the columns) begins with the 2008 and 2009 years for the EU-27 and EA-17 countries. Although now five years old, these tables are the only available source that is freely accessible, reliable, and comparable with the tables of all the EU countries. The construction of the tables for the whole EU-27 economy necessarily requires the availability of the individual tables for all the countries involved. At the present time, the 2010 table for the EU-27 countries has not yet been published, as the tables of four countries are still missing.

The first part of the study relates to the activities (included in the new NACE Rev. 2 classification under Section C) denoted as "Manufacturing", which is split into 24 divisions, among which there are the "Manufacture of food products, beverages, and tobacco products" (divisions 10, 11, and 12). These activities together encompass a total of 18 classes of products. Division 10 - "Manufacture of food products" has nine groups, articulated as: 10.01 Processing and preserving of meat and production of meat products; 10.02 Processing and preserving of fish, crustaceans, and mollusks; 10.03 Processing and preserving of fruit and vegetables; 10.04 Manufacture of vegetable and animal oils and fats, and dairy products; 10.05 Manufacture of dairy products; 10.06 Manufacture of grain mill products, starches, and starch products; 10.07 Manufacture of bakery and farinaceous products; 10.08 Manufacture of other food products; and

10.09 Manufacture of prepared animal feeds. Division 11 - "Manufacture of beverages" constitutes seven groups: 11.00 Manufacture of beverages; 11.01 Distilling, rectifying, and blending of spirits; 11.02 Manufacture of wine from grape; 11.03 Manufacture of cider and other fruit wines; 11.04 Manufacture of other non-distilled fermented beverages; 11.05 Manufacture of beer; 11.06 Manufacture of malt; and 11.07 Manufacture of soft drinks, production of mineral waters, and other bottled waters. Finally, Division 12 - "Manufacture of tobacco products" encompasses the group 12.00 Manufacture of tobacco products (Eurostat 2008).

The inter-temporal comparison (2000-2009) has been used as a reference for the NACE Rev 1.1. database Division 15 - "Manufacture of food products and beverages", not including tobacco products, which are classified under Division 16. The data for 2008-2009 have then been harmonized for food with these classifications. For the purposes of this study, therefore, secondary activities/productions are all those activities which are not included in the above definitions, and which are appropriately classified under other industries/groups of products, according to the same NACE Rev. 2/CPA classification.

In the second part of the study, after having calculated the economic importance of the food industries' primary and secondary production for EU-27 (2009), articulated by the core competences of industries, the methodology of BCG has been applied. This step entails the construction of the Growth-Share Matrix (GSM) for EU-27 in the years 2000-2009, appropriately modified for the purposes of this study. Following this globally applied matrix, industries have been subdivided in four groups with reference to B2B market environments, as follows: a) "stars", bigger and growing environments; b) "question marks", smaller but growing; c) "cows" bigger, but growing slowly; and d) "dogs" smaller and decreasing environments. These typologies, however, only represent the result of past investment trends by food firms in specific extra-core activities, and do not provide indications about firm's capability to successfully develop new strategic paths for further downstream diversification in its portfolio of secondary products.

To overcome difficulties, there is a need for the height of the entry barriers in the destination markets to be determined through specific indexes that are described below. In the literature there are other barrier indexes, but these are not suitable for the purposes of this study (Orr 1974, 39, Mann 1966). The originality of Chang's indices (Chang and Iseppi 2012, 112) is essentially that: (i) each industry/country is compared using a reference system of economic or geographical average behavior; (ii) the symmetry is fundamental: it considers, on the one hand, the insulation ability of each industry to build-up entry barriers against the entry of the reference industry and, on the other, the invasion ability of other industries to enter the core business area of the reference industry; and (iii) it also highlights the balance between the performance of entry barriers and the invasion ability. These indices have been applied in order to determine whether the markets of industries into which the food industry is entering and hoping to expand its market share have high or low entry barriers that prevent or allow penetration. The indices allow for both an ordering among individual sectors and individual countries, and for a measurement of the investigated phenomena. For each country (and for the complex of countries as a whole), the Supply matrix is taken by product and by industry. For a given industry i (n is their number), P_i denotes the proper production (namely the production in the industries' primary field of competence), S_i represents the industries' secondary production in all the other groups of

products, and A_i is the total secondary production of all the other industries involved in the core business of the given industry *i*. It is necessary to normalize the indexes, specifically:

(1) $p_i = P_i$ normalized by $\sum_{j=1}^{n} Aj$

(2) $a_i = A_i$ normalized by $\sum_{j=1}^{n} Pj$

(3) $s_i = S_i$ normalized by $\sum_{j=1}^{n} Sj = \sum_{j=1}^{n} Aj$

The first index is Chang's Entry Barrier Index:

(4) $$\Phi_i = \frac{\lg \frac{a_i}{p_i}}{1 + \left| \lg \frac{a_i}{p_i} \right|}$$

The value ranges from -1 to +1. If $a_i = 0$, no penetration happens, hence the index attains the maximum +1. The minimum -1 represents a theoretical limit case in which the entire production of an industrial sector is actually the secondary production of other industries.

The second index is Chang's $\sum_{j=1}^{n} Pj$ Invasion Index. This compares the differences between external secondary activities and internal (incoming) secondary activities, and normalizes them with the whole of the balance of secondary activities for all the sectors.
The Chang Invasion Index is:

(5) $$I_i = \frac{(n+1)(S_i - A_i)}{\left(\sum_{i=1}^{n} |Sj - Aj| \right) + n|S_i + A_i|}$$

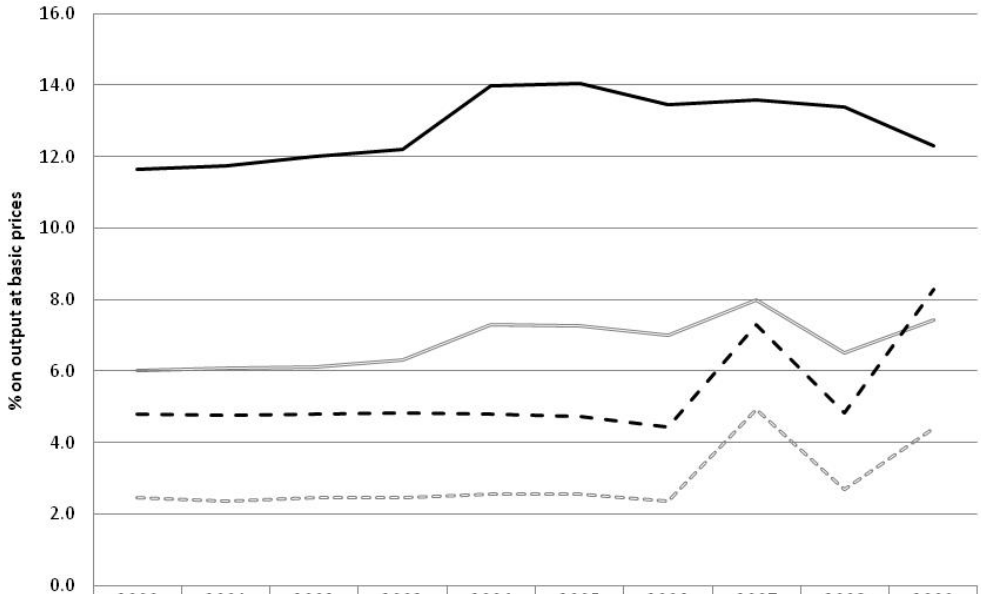
(Refer to index 13 in Chang and Iseppi 2011). The index ranges from -1 to 1. "Of course negative values mean that the invasion undergone by the industry is greater than the penetration it performs, 0 (zero) means balance, positive values mean that it expands more than it is invaded. Thus the index is not only connected to entry barriers, but is also tied to the capability or interest to overcome the entry barriers of other sectors" (Chang and Iseppi 2012, 113).

The Heterogeneity of Food Industry Diversification in Secondary Activities

Total domestic production at basic prices for the EU-27 whole economy in 2009 amounted to €22,028.66 billion. Adding imports of €1,465.66 billion and direct purchases made abroad by residents, and subtracting the Cif/fob adjustments on imports, produces a total figure for EU supply of goods and services of €23,649.94 billion, including exports. In terms of percentage share, primary production, being the sum of the core business activity of every industry, accounted for 92.6% of this total production (with a total value of €20,398.84 billion), while secondary production accounted for only 7.4% (a total of €1,629.82 billion).

Using this foundation, the industry named by NACE Rev. 2 as "Manufacture of food products, beverages and tobacco products" (hereafter food industry) had a total production of €882.15 billion, of which €844.76 billion pertained to primary production (95.76%), and €37.39 billion (4.24%) to secondary production. As can be seen, the incidence of primary production of the food industry is above the EU average (95.76% vs. 92.6% respectively), whilst the contrary is the case for secondary production (4.24% vs. 7.4% respectively). This implies that the food industry is less able and capable to undertake activities outside of its core business than the mean for the economy as a whole. The compound annual growth rate of food industry secondary products in the period 2000-2009 was 4.18% compared to 5.14% for the EU-27 manufacturing system as a whole. This suggests that food industry firms operating outside of their core business may have a first mover advantage. In the same period, the group of products (CPA), named food products, beverages, and tobacco products (hereafter food products), derived its total production of €878.7 billion from the activities of both the food industry and all other industries (rest of the economy). The value at basic prices of food products produced by other industries amounted to €33.9 billion, being only 3.86% of total Food Products, whilst the food industry produced the overriding part (96.14% compared to the primary production figure of 92.6% for the EU economy as a whole). These findings are a clear sign that the food industry has a medium difficulty in undertaking extra-core production, but that exogenous and endogenous barriers to entry into the market of food industry core business are of medium height in comparison to the rest of the economy (Table 2). In synthesis, the EU Food Industry has the potential to enter into the core activities of other industries, even though it has to date not managed to achieve even the average share of diversification of the economy as a whole. Meanwhile, the above figures demonstrate that entering the markets of food industry core business is, in theory at least, not easy for most firms from other industries.

From a functional point of view, Food Products can be classified as Final Manufacture (Chenery and Watanabe, 1958) since they mainly go directly to the final consumer, and firms buy intermediate inputs on output, which is above the mean of the economic system as a whole (74.4% vs. 52%). As a result of its investment policy, food industry performance is suboptimal since it gains a Net Operating Surplus (NOS) on production of 7.4% that is well below the average 12.3% for the EU economy as a whole. In reality its Consumption of Fixed Capital (CFK) on output is only 4.4% whilst that of the economy as a whole is 8.3%. Respectively, the CFK and NOS of the whole EU economy are consistently above those of the food industry (Graph 1). These figures indicate food industry's substantial inability in the medium term to adapt its production structures to the levels of the wider economy in order to increase the share of its operating surplus on output.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
FOOD CFK	2.5	2.4	2.5	2.5	2.5	2.6	2.4	4.9	2.7	4.4
FOOD NOS	6.0	6.1	6.1	6.3	7.3	7.3	7.0	8.0	6.5	7.4
ECO CFK	4.8	4.8	4.8	4.8	4.8	4.7	4.4	7.3	4.8	8.3
ECO NOS	11.6	11.7	12.0	12.2	14.0	14.1	13.5	13.6	13.4	12.3

Graph 1. % Share of consumption of fixed capital and net operating surplus on output (2000-2009).
Source. Authors' elaboration from Eurostat data

During the initial phase of the economic crises, the percentage share of the CFK on output had a fluctuating trend, both in the economy as a whole and in the food industry in particular. At the same time, the share of the NOS was dropping in the EU economy, while that of the food industry showed a marked recovery. Only by continuing this positive performance can the food industry hope to at least partially fill the gap.

In regard to the diversification of the food industry secondary production, 18 groups of products together encompass the main part of its efforts, considering those that furnish at least or near 1% of its secondary production (Table 1). These groups account for 95.9% of food industry secondary production, whilst the remaining 46 groups of products together represent only 4.1%. These data indicate that the degree of heterogeneity of the food industry secondary activity portfolio is too high and not strongly concentrated, since the first five groups of products constitute only 75.48% of food industry secondary production (in Agriculture the equivalent figure is 87%). The first research hypothesis (H1) is thus verified.

The food industry performs downward vertical integration with some service activities in the fields in which it has some sort of experience, either in conservative frame or in up-to-date evolution. The ten most important activities, in decreasing order of importance, are: wholesale trade services; chemicals and chemical products; retail trade services; real estate services; other professional, scientific and technical services; architectural and engineering services; technical testing and analysis services; accommodation and food services (previously named - until 2007 - hotel and restaurant services in NACE Rev. 1.1.); legal and accounting services; products of

agriculture, hunting and related services; and basic pharmaceutical products and pharmaceutical preparations. The principal field of secondary activity of the EU-27 food industry is wholesale trade services, with a value of €18.23 billion, being about 48.7% of the total secondary production (downstream in the Value Chain - VC). Thus the food industry delivers part of its production directly, bypassing wholesalers.

The next most important secondary activity is constituted by chemicals and chemical products (upstream in VC). In the food production process, chemicals are complementary products necessary for quality control and food safety. In this technological context, the food industry has acquired a bundle of extra-core competences that it properly exploits. The third most important food industry secondary activity is yet more downward in the value chain, specifically in the retail trade environment. This is one of the most profitable activities, in accordance with the mainstream-manufacturing model of diversification, since it can be split into a higher tier concentrating on rich consumers.

Table 1. Food industry secondary and primary production in the supply chain (EU-27, 2009).

No	Code	Secondary Products (CPA) of Food industry	Millions of Euro	% Share
29	CPA_G46	Wholesale trade services, except motor vehicles and motorcycles	18,225	48.73
11	CPA_C20	Chemicals and chemical products	3,505	9.37
30	CPA_G47	Retail trade services, except motor vehicles and motorcycles	2,545	6.80
44	CPA_L68B	Real estate services (excl. imputed rents)	2,301	6.15
50	CPA_M74_M75	Other professional, scientific, and technical services; veterinary services	1,657	4.43
47	CPA_M71	Architectural and engineering services; technical testing and analysis services	956	2.56
36	CPA_I	Accommodation and food services	863	2.31
46	CPA_M69_M70	Legal and accounting services; services of head offices; management consulting services	696	1.86
1	CPA_A01	Products of agriculture, hunting, and related services	637	1.70
12	CPA_C21	Basic pharmaceutical products and pharmaceutical preparations	629	1.68
48	CPA_M72	Scientific research and development services	597	1.60
34	CPA_H52	Warehousing, and support services for transportation	578	1.55
28	CPA_G45	Wholesale and retail trade and repair services of motor vehicles and motorcycles	578	1.55
31	CPA_H 49	Land transport services, and transport services via pipelines	496	1.33
51	CPA_N77	Rental and leasing services	431	1.15
24	CPA_D35	Electricity, gas, steam, and air-conditioning	414	1.11
27	CPA_F	Construction and construction works	391	1.05
40	CPA_J62_J63	Computer programming, consultancy, and related services; information services	368	0.98
		Food industry main fields of activities	**35,867**	95.92
		Other industries < 1% on the Total	1,525	4.08
		Total Secondary Production	**37,392**	100.0
		Principal Production	**844,756**	
		Total production of food industry	882,148	

Source. Authors' elaboration from Eurostat data.

This is the state-of-the-art of the food industry portfolio. The has a rather higher than average potential to also diversify its secondary production upstream by vertical integration into the Agricultural field of competence, and thus secure important sources of raw materials for itself. (Chang and Iseppi 2011). However, the exploitation of this product diversification does not seem to be among the priorities of the EU Food and Beverage Industry, considering that Agriculture is its second largest client and its main supplier (Chang and Iseppi 2011, 32). In fact, in 2007 it produced €1.07 billion of agricultural goods, corresponding to only 3.01% of its total secondary production, but in 2009 the agricultural production of the food industry further decreased, both in value and in share, falling to €0.637 billion and 1.7% respectively.

Instead the food industry's strategy of diversification prefers to expand its key complementary activities through related or concentric downward vertical integration, towards the Wholesale and Retail trade, and pure or conglomerate diversification activities mainly into the field of competence in Chemicals, for the reasons outlined above (Chang and Iseppi 2012). Meanwhile, the food industry focuses its attention only partially, and with a negligible and decreasing percentage share, on accommodation and food (hotel and restaurant) services (€0.86 billion being 2.32% of its total secondary activity in 2009, compared to €1.33 billion and 3.74% share respectively in 2007), considering that this sector is traditionally its main client (Chang and Iseppi 2011, 32).

As is well understood, smart manufacturers should aim to create new business models to capture profits at the end of the value chain, and to provide steady service-revenue from marketing and auxiliary services. This may allow them to capture a larger share of income in subsequent phases of the production-distribution process (Holland and Bruch 2010). However, during the recent economic crises the growth rate of those food industry secondary activities dropped below the average of the whole food industry.

There are therefore signs that the European Food Industry, focusing its interests on wholesale, is only partially pursuing a downstream vertical integration model, and in fact identifies the most lucrative activities even more downstream, specifically in the provision of services such as retail. This is the "profit imperative"! (Holland and Bruch 2010). Nevertheless there was, in 2009, an imbalance between the sale value achieved by the food industry in the wholesale trade market, which corresponds to €18.22 billion of €1,100.16 billion, and that in the retail trade market, which is only €2.55 billion of €770.12 billion. The share of the food industry market is respectively 1.66% and 0.33% of total domestic sales of those markets. On the contrary, smart manufacturers are creating new business models to capture profits at the end of the value chain, and to provide steady service-revenue. Moreover, in the manufacturing context, the revenues from downstream (high margins) may represent 10 to 30 times the annual volume of the underlying product sales! (Wise and Baumgartner 1999, 134). According to mainstream thought, in order to grab value downstream, smart food manufacturers should focus their attention on: i) the expansion of the food value chain definition until it includes both intermediate and final services; ii) customer loyalty rather than operational excellence; iii) rethinking their vertical integration (Wise and Baumgartner, 1999, 134). The best way to go downstream envisages the sale of products as a means to provide future services associated with commodities, on the basis of the following four business models: a) embedded services; b) comprehensive services; c) integrated solutions; and d) distribution control.

Trends in the Food Industry Secondary Activity Portfolio

For the purposes of positioning each industry within its competitive environment, this study has applied the BCG methodology, and in particular the *Growth-Share Matrix* developed by Bruce Henderson (1970), which has been appropriately modified. The model is useful in brand marketing, strategic planning, and production management. Despite some criticisms of this method, due mainly to the controversial relationship between market share and profits, and the difficulties of defining its strategic role in rapidly evolving markets (Collis & Montgomery 1995), it allows a first-general classification of B2B structured markets as competitive environments.

For comparison in the period from 2000-2009, the data of old and new series have been linked. Therefore, the captions and the statistics may not coincide with previous ones in the following analysis. The compound annual growth rate of each food industry extra-core production (y-axis of the GSM graph, Figure 1), as well as the logarithm of its percentage share (for 2009) of total secondary production (x-axis of the graph), have been calculated for the EU-27 countries. This is an alternative application of GSM, since the intention is to establish the position of secondary activities within the food industry portfolio, rather than their competitive position in the destination market. In the graph, the vertical axis crosses the horizontal axis as usual at 50% of the share of the biggest competitor (for the secondary activity of its portfolio), namely the Wholesale trade (22.19%; log=1.35). The Horizontal axis crosses the vertical one at the level of the average compound growth rate of the food industry secondary activities as a whole (4.18% in 2000-2009).

The obtained results enabled the classification of food industry secondary production under the 4 classical typologies shown from left to right in Figure 1.

Stars are fast-growing investments by the food industry outside its core business, which have a high impact on its secondary activities. A *Star* might only be cash-neutral, despite its strong position. Large amounts of investment may be required to defend their position against competitors.

Question Marks are fast-growing investments with low share of food industry secondary production. Substantial net cash input is required to maintain or increase their production share.

Cash Cows have a high secondary production share, but are slow growing. These should generate substantial cash inflows ready for using in other investments.

Dogs are secondary productions with low production share and slow-growing investments, and generally regard mature product in the final phase of their life-cycle. These investments tend to have a negative cash flow, which is likely to continue.

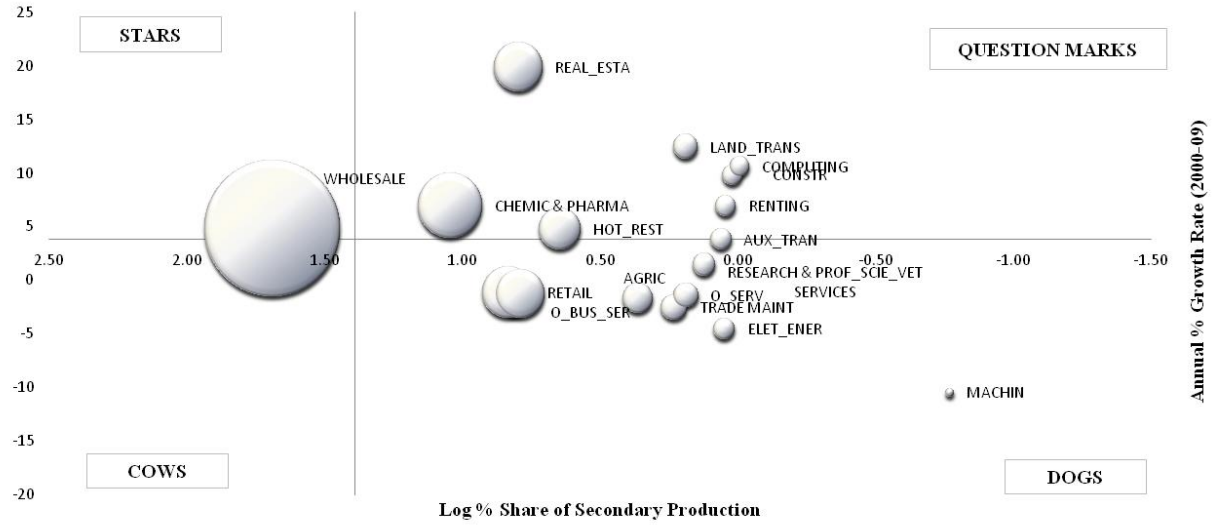


Figure 1. Growth-Share Matrix of secondary production of the EU-27 food industry (2000-2009).
Note. [1]First sixteen industries >1% in the share. [2]The dimension of the bubbles is related to the respective share of secondary production.
Source. Authors' elaboration from Eurostat data.

From the classification of the Growth-Share Matrix (2000-2009) for EU-27 above (Figure 1), the composition of the food industry secondary production portfolio can be seen below in Graph 2.

The *Wholesale* trade is at the same time positioned both in the *Cows* and the *Stars*, and is thus the main source of both cash and cost burden for the food industry, whilst it has great potential to become entirely a *Star*. It engenders safe investments, although it is growing at a slightly higher rate than most food industry secondary activities. This cash flow can provide funds for other investments, such as in the area of Research and development services that are growing fast (120.24%), particularly in the current period of economic crises (Graph 2, right side).

Moreover, from the Migration Graph (Graph 2), which represents the stability or the upward or downward trend (stable, up and down arrows respectively) of activities in the ranking of food industry secondary production share, it results that research has scaled as many as six positions in the portfolio (2000-2009), rising from 14th to 9th place. This may be the effect of aggregation with advertising and market research services, and especially with other professional, scientific, and technical services, and with veterinary services, which was not previously explicated by the statistics (Chang et al. 2013). However, this escalation demonstrates the clear interest of the food industry in direct investments in this field.

Ranking 2000		Migration trend	Ranking 2009		Compound annual growth rate		GSM Classification
Food Secondary production	Initial Position		Final Position	Ranking 2009	2000-09	2007-09	
WHOLESALE	1		1	WHOLESALE	4.82	7.54	**Cow-Star**
RETAIL	2		2	CHEMIC & PHARMA	6.97	1.69	**?**
REAL_ESTA	3		3	RETAIL	-1.16	-7.07	**Dog**
CHEMIC	4		4	RESEARCH & PROF_SCIE_VET S.	19.87	120.24	**?**
O_BUS_SER	5		5	REAL_ESTA	-1.29	-8.42	**Dog**
HOT-REST	6		6	O_BUS_SER	4.80	-17.62	**?-Dog**
AGRIC	7		7	HOT-REST	-1.64	-19.41	**Dog**
TRADE_MAINT	8		8	AGRIC	-2.55	-22.82	**Dog**
O_SERV	9		9	AUX_TRAN	12.45	22.63	**?**
RESEARCH	10		10	TRADE_MAINT	-1.42	-11.42	**Dog**
LAND_TRAN	11		11	LAND_TRAN	1.49	-14.30	**Dog**
RENTING	12		12	RENTING	3.79	13.48	**Dog-?**
ELET_ENER	13		13	O_SERV	-4.56	-15.30	**Dog**
AUX_TRAN	14		14	ELET_ENER	6.94	6.45	**?**
MACHIN	15		15	CONSTRUC	9.81	25.89	**?**
CONSTRUC	16		16	COMPUT	10.58	15.01	**?**
COMPUT	17		17	MACHIN	-10.47	-53.26	**Dog**

Graph. 2. Industry migration in the rankings of the main food industry secondary productions and growth rate (2000-09).
Source. Authors' elaboration from Eurostat data

Dogs are numerous (8), among which are: *Retail*, *Real Estate*, *Hotels and Restaurants*, *Agriculture*, etc. It is clear that the food industry is currently reducing the weight of dogs in its investment plan. They are resource dependent, and regard mature products only in the final phase of their life cycle. Nearly all *Dogs*, except *Agriculture*, have markets with low barriers to entry (Table 2), belonging to the III and IV quartile in terms of entry barriers, and so are subject to be invaded or heavily invaded by new entrants (III or IV quartile in terms of invasion index), with the exception of *Retail* and *Agriculture*, which are both predominantly invaders. The latter is also defended by very high entry barriers (Figure 1; Table 2 – I quartile).

There are no activities in the *Stars* that the food industry can hope will become *Cows* or able to be milked for further investments.

Question Marks are also numerous (8). These are the investments made by the food industry to diversify its portfolio assets, which are growing at a higher than average rate (except *Renting*, although this too is growing faster in the last period – Graph 2), and represent a real opportunity, albeit at different levels of development and portfolio share. Only the *Chemical* industry remains on the borderline of *Stars*, although it is not the most dynamic in terms of growth. In the Migration Graph, *Chemical* scaled 2 positions in the share, but this may be the effect of the aggregation with *Basic Pharmaceutical Products* and *Pharmaceutical Preparations.* Notwithstanding, it is important to note the commitment of the food industry in this field. The industry has high entrance barriers (II Quartile) and a high propensity to invade (III Quartile), but the food industry should have no problems to maintain this type of activity, owing to its specific

knowledge acquisition (capabilities) and development, as the food industry possesses infrastructures and technological competences in this field (Chang et al. 2013, 303).

Among the *Question Marks* in 2007, there were *Hotels and Restaurants*, and *Agriculture*, but these have not withstood the economic crisis, and have slipped down into the *Dogs*' domain (with a compound annual de-growth rate of around 20%; Graph 2). The "real estate bubble" has negatively affected some secondary activities of the food industry because they do not have enough marketshare to face the challenge of the ongoing crisis through economies of scale. From 2007 to 2009 this crisis has frozen or even reversed food industry expectations for at least 9 out of 17 extra-core activities, as can be seen from Graph 2 (last part).

From Figure 1 and Table 2, it appears that the food industry has the tendency to diversify its secondary production into the fields in which it has competence, and which have low barriers to entry (in 10 out of 14 cases), such as *Wholesale*, *Research*, *Auxiliary Transport*, *Computing*, *Renting*, etc.

Finally, notwithstanding its medium height barriers to entry, the food industry is itself invaded by other industries. The reason could be that, owing to its heterogeneity, niches arise in its market, especially in the field of experience goods. This is the case with the invasion by *Agriculture* into the fields of quality wine and olive oil.

Table 2. Classification of barriers to entry and invasion capability of the markets in which EU food industry undertakes secondary production (2007).

Industries/Groups of products	Chang's Entry Barriers Index ×100	Position in the EU Economy Ranking (Quartile)	Chang's Invasion Index ×100	Position in the EU Economy Ranking (Quartile)	Classification	
					Barriers	Capability to Invade/ Being invaded
Food products and beverages	15	II	-4	III	Medium	Balanced
Wholesale trade and commission trade	-27	IV	-3	III	Very Low	Balanced
Chemicals, chemical products, and man-made fibers	5	II	24	III	High	Invader
Retail trade services, except motor vehicles	-10	III	21	III	Low	Invader
Real estate services	0	II	-65	IV	Low	Heavily invaded
Other business services	-18	IV	-52	IV	Low	Heavily invaded
Hotel and restaurant services	-3	III	-28	IV	Low	Heavily invaded
Products of agriculture, hunting	45	I	47	I	Very High	Strong Invader
Research and development services	-43	IV	-56	IV	Very Low	Heavily invaded
Trade, maintenance, and repair services	-34	IV	-40	IV	Very Low	Heavily invaded
Land transport, transport via pipeline	-7	III	-4	III	Low	Balanced
Renting of machinery services	-40	IV	-65	IV	Very Low	Heavily invaded
Electrical energy, gas, steam, and hot water	39	I	52	I	Very High	Strong Invader
Construction work	22	II	-12	IV	High	Heavily invaded
Computer and related services	-27	IV	-32	IV	Very Low	Heavily invaded
Supporting and auxiliary transport services	-5	III	6	III	Low	Invader
Machinery and equipment n.e.c.	-14	III	1	III	Low	Invader
Other services	-33	IV	-43	IV	Very Low	Heavily invaded

Source. Authors' elaboration from Eurostat data.

This data suggests the plausibility of this study's second hypothesis (H2), according to which entry barriers to the acquisition of extra-core capabilities for food industry firms (in the destination markets of the main fields of their investment portfolio) are lower than those existing for firms active in other industries. This issue deserves further research in order to verify whether the same hypothesis holds true in every food industry destination market environment. At this stage, the impression following the RBT, is that market permeability also depends on the firm's internal capabilities, and not only on the height of the entry barriers.

Discussion and Final Remarks

This study has several implications for management. Firstly, it confirms the idea that entering the food industry core business market might not be very hard for newcomers, but it is not easy especially in a stagnant market. In that case, entry barriers and inertia may influence firms, leading them to adopt a long-term viewpoint. This is the strategic element required to optimize rents deriving from firms' market share (Rumelt and Wensley 1981, 2-16, Wernerfelt 1982, 11-19). Consequently, these core business capabilities could be managed in order to keep the level of imitation of products low, creating "isolating mechanisms" (Rumelt 1984), and barriers to competitive duplication of firms' strategic assets (Peteraf 1993, Barney 1986).

Secondly, it emerges that the EU Food Industry has capabilities to undertake activities outside its core business *below* the average, having a share of secondary production lower than the EU average. Consequently, specific capabilities aimed at empowering ancillary revenue streams need to be acquired or improved. This might be done, for example, with the implementation of internal operations pre and post-sales in related services, in order to familiarize and raise awareness among new clients, and deepen their knowledge of food experience goods. According to the Nelson classification scheme, food goods are "experience items", even though much relevant information about them is available prior to purchase (Nelson 1970, Laband 1991).

Further implications concern processes of knowledge integration on B2B markets. Food industry firms, exploring extra-core activities ahead of their competitors, could control the expected discounted future above-average returns obtainable from the newly acquired capabilities which are going to become competences. Strategically, firms could manage the price and/or the value of an extra-core capability even more precisely, if the market of factors for *that specific resource* comes close to perfect competition (Barney 1986, Dierickx and Cool 1989). Regarding upward trends, the rapidly emerging position of Research, Professional, Scientific and Veterinary Services, and Auxiliary transport demonstrates the growing attention of the food industry to innovation and logistics. This indicates the growing need for food industry firms to acquire, share, and transfer knowledge, as well as to develop capabilities for managing distribution networks. This study highlights the importance of well-structured databases for understanding B2B market acquisition and development, and firm's decision-making processes.

From a theoretical viewpoint, the escalation of the value creation process is of great importance for defending competitive advantage. As one of the most prominent RBT scholars underlined, current resources reduce the costs of resource acquisition (Wernerfelt 2011). In this respect, the above analysis suggests that food industry secondary production is too heterogeneous and distributed over too wide a range of activities, and thus of capabilities. Heterogeneity is an

attribute that may be both a strength, and a weakness. It is a strength when the degree is deliberately decided by a firm to compensate for the major costs deriving from the absence of scale economies, otherwise it can become a point of weakness. In this regard, experience teaches that the greater the scale of production, the lower the costs per product unit. It follows that if the degree of heterogeneity is too high, resulting in small-scale productions, the unit costs rise. The gap between the unit costs of primary (core business) and secondary production may widen further in relation to extra-core production, although this rise may be hidden by joint and connected costs. If the company's resources are distributed among a plurality of subtasks, the value of each secondary production does not reach the critical mass capable of filling the gap in average costs within a reasonable range of tolerance. The gap is tolerable when it is covered by the reduction of the transaction costs that the company might otherwise incur without such extra-core productions. To be coherent, the food industry should be much more selective in choosing the composition of its portfolio of secondary productions, reducing their number in order to increase production scale, and thus reduce unit costs. The first mover food industry firms need to plan the escalation of their extra-core business value creation processes (Fraser and Ginter 1988), leveraging the extra-core business capabilities they already acquired.

On the other hand, it should be noted that plurality of technical and economical knowledge favors creative innovation, whilst strict specialization encourages only incremental innovation. The growing integration of food and wholesale businesses with the Research Triangle highlights the capabilities that food industry is trying to build. Obviously costs are increasing, but in the case of successful strategies, the gains of innovation can be extremely higher, in much the same way as buying a winning lottery ticket would be.

Downward vertical integration processes in the secondary production of the food industry is primarily concerned with the wholesale trade. An intermediate channel is perhaps the most suitable first step to connecting with customers who are present in more distant markets. Food industry firms have the possibility both to expand their activity in the wholesale environment, and to optimize the balancing of sales in wholesale compared to retail markets, for example by innovating the retail proximity distribution networks. Finally, the extra-core potential capabilities of food industry firms are mainly related to functions of marketing, sales, transportation, and logistics.

This study seeks to describe the situation regarding extra-core production, productive trends, and capability flows, in connection with profitability. It does not intend to push the analysis beyond the important aspect of cash flows and related capabilities. It proposes a unified intelligence system platform at the European Union level, in an attempt to facilitate the definition of a common strategy for the development of extra-core capabilities for food industry and other food-based sectors such as tourism (Droli et al. 2014a; Droli et al. 2014b). Finally, the study lays the foundation for further studies in the field of integrating knowledge acquisition, knowledge development, and business management systems.

References

Amit, Raphael and Paul J.H. Schoemaker. 1993. "Strategic assets and organizational rent." *Strategic Management Journal* 14 (1): 33-46.

Bain, J. S. 1956. *Barriers to new competition*. Cambridge: Harvard University Press.

Barney, Jay B. 1986. Strategic factor markets: Expectations, luck and business strategy. *Management Science* 42: 1231-1241.

Barney, Jay B., and Robert E. Hoskisson. 1989. Strategic groups: untested assertions and research proposals. *Managerial and Decision Economics* 11: 187-198.

Barney, Jay B., Abigail McWilliams, and Thomas Turk. 1989. On the relevance of the concept of entry barriers in the theory of competitive strategy. Proceedings from the 9th Annual Meeting of Strategic Management Society (AMSMS) Conference. 12 October. San Francisco.

Barney, Jay B. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17 (1): 99-120.

Barney Jay B., Mike Wright, and David Ketchen. 2011. The future of resource based theory: Revitalization or decline? *Journal of Management* 37 (5): 1299-1315.

Caves, Richard E., and Michael E. Porter. 1977. From entry barriers to mobility barriers: Conjectural decisions and contrived deterrence to new competition. *Quarterly Journal of Economics* 91: 241-262.

Chang, Ting Fa Margherita and Luca Iseppi. 2011. Specialization versus Diversification in EU Economies: a Challenge for Agro-food? *Transition Studies Review* 18 (1): 16-37.

Chang, Ting Fa Margherita and Luca Iseppi. 2012. EU Agro-Food Chain and Vertical Integration Potentiality: a Strategy for Diversification? *Transition Studies Review* 19 (1): 107-130.

Chang, Ting Fa Margherita, Livio C. Piccinini, Luca Iseppi, and M. A. Lepellere. 2013. The black box of economic interdependence in the process of structural change. EU and EA on the stage. *Italian Journal of Pure and Applied Mathematics* 31: 285-306.

Chenery, Hollis B., and Tsunehiko Watanabe. 1958. International Comparisons of the Structure of Production. *Econometrica* 26 (4): 487-521.

Combs, James G., David J. Ketchen Jr., Duane R. Ireland, and J. Webb. 2011. The Role of Resource Flexibility in Leveraging Strategic Resources. *Journal of Management Studies* 48 (5): 1098-1125.

Collis, David J., and Cynthia A. Montgomery. 1995. Competing on resources: Strategy in the 1990s. *Harvard Business Review* 73 (4): 118-128.

Demsetz, Harold. 2000. "The theory of the firm revisited." In *The Theory of the firm. Critical perspectives on business and management*. Edited by Nicolai J. Foss, 102-122. London: Routledge.

Dierickx, Ingemar and Karel Cool. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35: 1504-1511.

Droli, Maurizio, Ting Fa Margherita, Chang, Luca Iseppi, and L. C. Piccinini. 2014a. Managing trade contacts in HotRest intermediate markets: a resource-based analysis in EU countries. *Tourism Economics* 20 (4): 757-778.

Droli, Maurizio, Ting Fa Margherita, Chang, and Luca Iseppi. 2014b. Does Smart Agriculture Go Downstream in the Supply Chain? *Italian Journal of Food Science* 26 (4): 451-457.

Eurostat 2008. *Eurostat Manual of Supply, Use and Input-Output Table.* Eurostat Methodologies and working papers, Luxembourg: Eurostat.

Fraser, Cynthia and James L. Ginter. 1988. Competitive dealing strategy and deal value escalation. *Management Science* 34 (11): 1315-1323.

Grant, Robert M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal* 17: 109-122. [Special issue, Winter]

Grant, R. M. 1999. *L'analisi strategica per le decisioni aziendali*. Bologna: Il Mulino.

Hamel, Gary and Coimbatore K. Prahalad. 1994. "Competing for the Future: Breakthrough Strategies for Seizing Control of Your Industry and Creating the Markets of Tomorrow." Boston: Harvard Business School Press.

Henderson, B. D. 1970. Perspectives on the Product Portfolio. Boston: Boston Consulting Group.

Holland, R., and Megan L. Bruch. 2010. Census of Agriculture Data Shows Growth of Value-Added Farm Enterprises in Tennessee. Centre for Profitable Agriculture, University of Tennessee: Institute of Agriculture.

Kaplan, Robert S., and David P. Norton. 2004. *Strategy Maps.* Cambridge: Harvard University Press.

Kneafsey, Moya, Laura Venn, Ulrich Schmutz, B. Balázs, L. Trenchard, T. Eyden-Wood, E. Bos, G. Sutton, and M. Blackett. 2013. *Short Food Supply Chains and Local Food Systems in the EU. A State of Play of their Socio-Economic Characteristics*. European Commission, Bruxelles: Joint Research Centre (Provisional Version).

Laband, David N. 1991. An objective measure of search versus experience goods. *Economic Inquiry* 29 (3): 497-509.

Lieberman, Marvin B., and David B. Montgomery. 1988. First mover advantages. *Strategic Management Journal* 9: 41-58.

Lippman, Steve A., and Richard P. Rumelt. 1982. Uncertain inimitability: An analysis of inter firm differences in efficiency under competition. *Bell Journal of Economics* 13: 418-438.

Machlup, F. 1980. *Knowledge: Its Creation, Distribution, and Economic Significance*. Vol. 1, Princeton, NJ: Princeton University Press.

Makadok, Richard. 2001. Toward a Synthesis of the Resource-Based View and Dynamic-Capability Views of Rent Creation. *Strategic Management Journal* 22 (5): 387-401.

Makadok, Richard, and Jay B. Barney. 2001. Strategic factor market intelligence: An application of information economics to strategy formulation and competitor intelligence." *Management Science* 47: 1621-1638.

Mann, H. Michael. 1966. Seller concentration, barriers to entry, and rates of return in thirty industries, 1950–1960. *The Review of Economics and Statistics* 48 (3): 296-307.

Maritan, Caterine, and Margaret A. Peteraf. 2011. Building a bridge between resource acquisition and resource accumulation. *Journal of Management* 37: 1374-1389.

Nelson, Phillip. 1970. Information and Consumer Behavior. *Journal of Political Economy* 78 (2): 311-329.

Orr, Dale 1974. An index of entry barriers and its application to the market structure performance relationship. *The Journal of Industrial Economics* 23 (1): 39-49.

Penrose, Edith E. 1959. *The Theory of the Growth of the Firm*. New York, NY: Oxford University Press.

Peteraf, Margaret A. 1993. The cornerstones of competitive advantage: A Resource-Based View. *Strategic Management Journal* 14 (3): 179-191.

Porter, M. 1980. *Competitive Strategy*. New York, NY: Free Press.

Porter, M. 1985. *Competitive Advantage: creating and sustaining superior Performance*. New York, NY: Free Press.

Rumelt, Richard P. 1984. "Towards a strategic theory of the firm." In Competitive Strategic Management, edited by R. Lamb, 556-570. Englewood-Cliffs, NJ: Prentice-Hall.

Rumelt, Richard P. and Robin Wensley. 1981. In search of the market share effect. Conference Proceedings of the 41st Meeting of the Academy of Management (MAM) Conference, edited by Academy of Management. August 1-5, San Diego, CA.

Sirmon, David G., Michael A. Hitt, Duane R. Ireland, and B. A. Gilbert. 2011. Resource orchestration to create competitive advantage: Breadth, depth and lifecycle effects. *Journal of Management* 37: 1390-1412.

Sun, Pei, Mike Wright, and Kamel Mellahi. 2010. Is entrepreneur-politician alliance sustainable during transition? The case of management buyouts in China. *Management and Organization* 6: 101-121.

Teece, David J., Gary Pisano, and Amy Shuen. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal* 18: 509-534.

Valdani, E. 2003. *Marketing strategico. Un'impresa proattiva per sviluppare capacità market driving e valore*. Bologna: Etas.

Wernerfelt, Birger. 2005. The relation between market share and profitability: an attempted synthesis. Working Paper no. 306, The University of Michigan.

Wernerfelt, Birger. 1984. A resource-based view of the firm. *Strategic Management Journal* 5 (2): 171-180.

Wernerfelt, Birger. 2011. The use of resources in resource acquisition. *Journal of Management* 37 (5): 1369-1373.

Wise, Richard and Peter Baumgartner. 1999. Go Downstream: The New Profit Imperative in Manufacturing. *Harvard Business Review* 77: 133-141, September-October.

Zahra, Shaker A., Igor Filatotchev, and Mike Wright. 2009. How do threshold firms sustain corporate entrepreneurship? The role of boards of directors and knowledge. *Journal of Business Venturing* 24: 248-260.

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

The Health Effects of Women Empowerment: Recent Evidence from Northern Ghana

Kara L. Ross[ⓘa], Yacob A. Zereyesus[b], Aleksan Shanoyan[c], and Vincent Amanor-Boadu[d]

[a] *Research Assistant Professor, Department of Agricultural Economics, Kansas State University, 306 Waters Hall, Manhattan, Kansas, 66506, USA*

[b] *Research Assistant Professor, Department of Agricultural Economics, Kansas State University, 307B Waters Hall, Manhattan, Kansas, 66506, USA*

[c] *Assistant Professor, Department of Agricultural Economics, Kansas State University, 307D Waters Hall, Manhattan, Kansas, 66506, USA*

[d] *Professor, Department of Agricultural Economics, Kansas State University, 306 Waters Hall, Manhattan, Kansas, 66506, USA*

Abstract

Women empowerment could be the key to unlocking women's productivity potential in Africa. Women's contribution to the agricultural sector is greatly influenced by their health status. This paper examines the impact of women's empowerment in agriculture on women's health and the implications for the African food and agricultural sector. It utilizes a unique dataset from a 2012 survey of 2,405 women in northern Ghana and the Multiple Indicators Multiple Causes modeling approach. Findings provide insight on how gender-sensitive policies and private-public initiatives can translate into better health outcomes for women and improved capacity to meet future needs of food and agriculture in Africa. Initiatives focusing on increasing women's membership in social and economic groups, easing women's access to credit, and increasing women's incomes are some key empowerment strategies for improving women's health status and production capabilities.

Keywords: women empowerment, agriculture, health, Ghana, Africa

ⓘCorresponding author: Tel: + 1.785.532.3526
Email: K. L. Ross: kross02@ksu.edu
Y.A. Zereyesus: yacobaz@ksu.edu
A. Shanoyan: shanoyan@ksu.edu
V. Amanor-Boadu: vincent@ksu.edu

Introduction

Women play a significant role in the agricultural sector in developing countries. Recent evidence from developing countries indicates that women supply, on average, 43 percent of the agricultural labor force, but in Sub-Saharan Africa, this contribution is nearly 50 percent (FAO 2011). They also constitute a significant proportion of the wage workers in the agri-food supply chain (FAO 2011, 2010). In addition to their roles in agriculture, women have a vital role in household production and are usually the primary care givers within the household.

A woman's role, responsibilities, and activities in household production and, particularly, in agricultural production are time consuming and physically demanding, requiring significant energy and physical capacity. This implies that women's ability to effectively undertake these agricultural and household production activities is greatly influenced by their physical capability and their health status. Smith et al. (2003) states that improving women's health status can effectively enhance their performance in their socioeconomic responsibilities, including increasing agricultural production by becoming more efficient and skilled laborers.

A woman's health status is influenced by her access to and control over resources that affect food availability and her ability to be responsible for her health care needs (Mabsout 2011, Sahn and Younger 2009). Therefore, the empowerment of women to have more decision rights over the dimensions of their lives that affect their health and capability in performing income generating and care giver responsibilities has been receiving significant attention in recent years (De Schutter 2013, FAO 2011).

Empowering women is a complex concept given the socio-cultural dimensions embedded in gender relations and politics (Samman and Santos 2009). This complexity also confounds the development of a good definition for the concept of women's empowerment. The two main elements that are widely accepted in the definition of empowerment are "process" and "agency". Empowerment is considered to be a process, a transition in an individual's decision-making capability from where she is denied choices to a position where she has the ability to choose for herself. The second element—agency, states that an individual must play a role in this process of change. The concept of agency is the "ability to define one's goals and act upon them" (Kabeer 1999). These two key elements are expressed in the following definition for women's empowerment that is adopted in the study: "women's ability to make decisions and affect important outcomes for themselves and their families as well as have control over their life and over their resources" (Malhotra, Schuler, and Boender 2002).

The purpose of this study is to gain insights into the relationship between women's empowerment in agriculture and women's health status. This research uses survey data that includes a newly developed index, Women Empowerment in Agriculture Index (WEAI). The WEAI is designed to meet the need for a robust and comparable tool that measures the empowerment, agency, and inclusion of women in the agricultural sector. This study contributes to the literature by utilizing the WEAI to examine the impact of women's empowerment in agriculture on women's health status. To the authors' best knowledge, this is the first peer-reviewed research study to analyze these survey data and the WEAI in relation to women's health status in northern Ghana. The Multiple Indicators Multiple Causes (MIMIC) model is

used to assess how two primary indicators of women's physical health status - body mass index (BMI) and women's dietary diversity score (DDS) - are influenced by empowerment and autonomy indicators. The paper hypothesizes that a greater degree of women's empowerment and decision-making capabilities leads to a higher health status. The insights gained from testing this hypothesis will contribute to a greater understanding of how women's empowerment in agriculture is associated with women's health status. The findings from this study can help guide public-private initiatives in developing more appropriate and effective empowerment strategies that are focused on improving the health and well-being of women in northern Ghana. These strategies may also help to enhance women's productivity in agriculture in northern Ghana and other Sub-Saharan Africa countries.

Health is a complex multidimensional concept, encompassing physical, mental and emotional components of an individual. For the purpose of this study, only the physical aspect of health will be examined. Universally accepted physical health measures that are commonly used are BMI and women's DDS. BMI is an unobtrusive measure and is defined as the ratio of an individual's weight in kilograms to her height in meters squared (kg/m^2) (WHO 2014, CDC 2014). BMI provides a reliable measure for body composition, which is used in health screenings for potential health problems associated with body weight. BMI is both age and gender independent, making this measurement very versatile, consistent, and easy to compute. The women's DDS serves as an indicator of women's consumption of diverse foods with adequate micronutrients and nutritional quality, which is universally recognized as a key component of healthy diets. This score helps identify if particular micronutrient deficiencies exist within a certain population, and it also provides insights for policy makers and health professionals to effectively promote good health and diets with adequate intake of essential nutrients. Each of these health measures is assumed to be a component of a woman's health status, which is unobserved.

Methods

In this study, a special specification of the Structural Equation Modeling (SEM) approach is used, the Multiple Indicators Multiple Causes (MIMIC) model. This MIMIC model is an ideal model to use when multiple dependent variables need to be associated with a "single" variable. Two women's health status indicators represent the dependent variables in this research – BMI and DDS. Since these indicators are not independent of each other, the MIMIC model is more appropriate for this analysis than other traditional structural equation models. The MIMIC model was used by Mabsout (2011) to study women's health as indicated by their BMI and anemia status. The results from his study indicated that women's health can be improved by changing household decision-making patterns.

Following Joreskog and Goldberger (1975) and Spanos (1984), a vector, $K = (k_1 ... k_n)'$, of observable latent causes of a woman's health status, H^* is developed. Equation 1 describes this relationship with the error term, ε, assumed to have a zero mean and a unity standard deviation, and $a = (a_1 ... a_n)'$ is a vector of the parameters to be estimated:

$$(1) \quad H^* = a'K + \varepsilon$$

It is assumed that the latent women's health status determines the observable health status indicators of interest in this study, *H*. This relationship is expressed in Equation 2 as follows:

$$(2) \quad H = bH^{*} + \upsilon$$

where $H = (h_1 ... h_m)'$ represents a vector of observable endogenous variables, $b = (b_1 ... b_n)'$ is a vector of parameters to be estimated, and $\upsilon = (\upsilon_1 ... \upsilon_m)'$ is a vector of mutually independent error terms. It is assumed that $E(\varepsilon\upsilon') = 0$, $E(\varepsilon^2) = \sigma^2$, and $E(\upsilon\upsilon') = \Theta^2$, with Θ being an *m x m* diagonal matrix.

The MIMIC model, which is the reduced form of equations (1) and (2), presents the observable health status indicators, *H*, as a function of the observable exogenous variables, *K*, suggesting that:

$$(3) \quad \begin{array}{l} H = \lambda' K + \mu \\ where\ \lambda = ab\ and\ \mu = (b\varepsilon + \upsilon) \end{array}$$

At least two observable indicators and at least one exogenous variables are needed to ensure that the MIMIC model is identified, provided that one of the factor loadings of the indicators is set equal to one to form the scale of the latent variable. Since the problem in this study meets the criteria for identification, the MIMIC model can be used in the estimation. The MIMIC model is estimated by the maximum likelihood method.

The exogenous variables do not all have the same units, which makes comparison among the variables uninformative. Following the approach recommended by Bollen (1989), the coefficients are standardized to eliminate their measurements. Standardization of the coefficients will allow comparisons across the variables. It is essentially the same approach as elasticities, which are commonly used by economists to determine the relative importance of the contributions of variables in a model and provides the same information. We can determine which independent variables' one percent change leads to the largest percent change in dependent variables. With elasticities, the contribution or effect of the independent variable approaches infinity as the point of estimation reaches zero. The point of estimation is typically the mean. Thus, a mean of zero results in no solution.

To avoid this risk, other unitless indicators are used to determine relative influence. The standardized regression coefficients, $\hat{a}_{ij}^{s}$ and $\hat{b}_{ij}^{s}$ are represented as follows:

$$\hat{a}_{ij}^{s} = \hat{a}_{ij}\left(\frac{\hat{\theta}_{jj}}{\hat{\theta}_{ii}}\right) \text{ and } \hat{b}_{ij}^{s} = \hat{b}_{ij}\left(\frac{\hat{\theta}_{jj}}{\hat{\theta}_{ii}}\right)$$

where i is the dependent variable, j is the explanatory variable, $\hat{\theta}_{ii}$ and $\hat{\theta}_{jj}$ are the model-predicted standard deviations of the i^{th} and j^{th} variables, respectively. The standardized coefficients represent the mean response in standard deviation units of the dependent variable for a one standard deviation change in the explanatory variables, ceteris paribus.

The outcome of interest is women's health status measured by the BMI and DDS indicators. These indicators, therefore, are the dependent variables in the estimation models. The explanatory variables are the WEAI and the ten principal components of the WEAI, as well as the demographic and socio-economic characteristics of the women. The summary statistics, along with the variable definitions, are presented in Table 1.

Data

The research uses data from a USAID-funded, population-based survey conducted during July and August of 2012 in northern Ghana. A two-stage stratified random sampling technique is adopted in the survey, and probability weights are developed to account for differential probabilities of selection and non-responses from the households, resulting in a design representative of the population in northern Ghana. For this particular study, the focus is on the health conditions of the self-identified primary woman in each household. Primary members of the household are the ones responsible for making social and economic decisions, and are, typically, a husband and wife.

The study sample is comprised of 4,513 women, aged 15 to 49 years, with complete dietary diversity information and anthropometric measurements. There are 23 women with "extremely high" BMI measurements for their weight/height profiles; they are treated like outliers and excluded from the study's sample. Of the remaining 4,490 women, 2,405 are the primary women and are the focus of this study.

Health Indicators: BMI and DDS

BMI is currently considered the standard in determining nutritional status and health risk conditions (Wells and Fewtrell 2006). It provides a very economical way to classify people by their potential health riskiness: BMI of less than 18.5 kg/m^2 are underweight; BMI between 18.50 kg/m^2 and 24.99 kg/m^2 is normal; and BMI greater than 25 kg/m^2 is overweight or obese. Women with BMI values in the underweight category face a serious problem in developing countries, given their role in the economic well-being and health of their families. For women whose daily economic activities involve agricultural and other physically-demanding work, being underweight impedes their ability to perform their activities efficiently. Women who are underweight spend more time performing their daily activities (Kennedy and Garcia 1994), and they are at a higher risk of developing functional disabilities (Ferraro et al. 2002) compared to their counterparts with BMIs in the normal range. Kennedy and Garcia (1994) show that having a healthy (or normal) BMI increases the capacity to perform domestic and agricultural activities.

The women's DDS is estimated using a count of nine food groups consumed over the preceding 24 hours; the food groups were developed by Kennedy et al. (2011). The nine food groups are: (1) starchy staples; (2) dark green leafy vegetables; (3) other vitamin A rich fruits and vegetables; (4) other fruits and vegetables; (5) organ meat; (6) meat and fish; (7) eggs; (8) legumes and nuts; and (9) milk and milk products. The three categories of the DDS score – low, medium, and high – are based on the number of these food groups consumed (Kennedy et al. 2011). A low DDS has no more than three of the food groups, while a medium DDS includes four to five of the food groups. A high DDS represents the consumption of more than five of the food groups. Dietary diversity scores have been positively correlated with macronutrient and micronutrient adequacy of diets for adults (Olge et al. 2001, Foote et al. 2004, Arimond et al. 2010). Savy et al. (2005) report a positive relationship between dietary diversity scores and

nutritional status of adult women in rural Burkina Faso. Bhagowalia et al. (2012) found that Bangladeshi women who have a greater level of empowerment, as measured by their education, height, and attitudes towards abuse, decision-making power, and mobility, were associated with greater dietary diversity scores and reduced levels of stunted children. Low DDS may present risks of micronutrient deficiencies, such as iron deficient anemia, that can affect a woman's ability to provide adequate care for her family and lower her income-generating potential (Haddad et al. 1994, WHO 2013).

Table 1. Statistics Summary

Variable	Description	Mean	Std. Dev
Demographic and Socio-economic variables			
Age	Years	32.32	7.93
Education	1=Some formal education training; 0=no education	0.09	0.28
Marital Status	1=Married/Cohabitation; 0=Not married/cohabitating	0.96	0.20
Income deciles		5.14	2.76
Household hunger scale	1=Moderate to severe hunger	0.38	0.48
Household characteristics and location variables			
Household size	Household members	6.21	3.08
Safe drinking water	1=Household drinking water is safe; 0=is not safe	0.70	0.46
Access to electricity	1=Access to electricity; 0=No toilet	0.27	0.45
Private toilet	1=A private toilet in household; 0=No toilet	0.14	0.35
Urban locale	1=Urban; 0=Rural	0.23	0.42
Women empowerment in agricultural variables			
WEAI inadequacy count	Inadequate > 0.20	0.34	0.18
Input in productive decisions	1=Inadequate; 0=Adequate	0.33	0.47
Autonomy in production	1=Inadequate; 0=Adequate	0.26	0.44
Ownership of assets	1=Inadequate; 0=Adequate	0.44	0.50
Purchase, sale, or transfer of assets	1=Inadequate; 0=Adequate	0.73	0.44
Access to and decisions on credit	1=Inadequate; 0=Adequate	0.79	0.41
Control over use of income	1=Inadequate; 0=Adequate	0.22	0.42
Group member	1=Inadequate; 0=Adequate	0.29	0.45
Speaking in public	1=Inadequate; 0=Adequate	0.30	0.46
Leisure time	1=Inadequate; 0=Adequate	0.13	0.34
Work burden	1=Inadequate; 0=Adequate	0.45	0.50
Women well-being variables			
BMI	Underweight if BMI < 18.5	22.33	3.62
DDS	Score ranges from 0 to 9	3.99	1.59
Total samples		2,405	

Women's Empowerment in Agriculture Index (WEAI)

The WEAI is a newly developed survey-based index that was created to monitor and evaluate women's empowerment in the agricultural sector. Development of the WEAI was a collaborative effort between USAID, International Food Policy Research Institute (IFPRI), and the Oxford Poverty and Human Development Initiative (OPHI). The WEAI measures the multi-dimensional aspects of gender inequality in agriculture. Previous empowerment measures are limited in their ability to measure women's decision-making and autonomy outside of the household and domestic activities (Alkire et al. 2012). Given the importance of women in agriculture, it is essential to have a tool, such as WEAI, that measures the effect of agriculture interventions on women's empowerment within that sector. The WEAI is constructed using two weighted sub-indices developed by Alkire et al. (2012): (1) The Five Domain Empowerment Index (5DE); and (2) The Gender Parity Index (GPI).[1] The 5DE index encompasses five domains of empowerment: production, resources, income, leadership, and time. The GPI, on the other hand, measures the empowerment of women compared to their male counterparts in the household. Thus, GPI is useful for male and female gendered households and not particularly useful when employed for female only gendered households. Given the study's focus on women's health and their empowerment, the GPI dimension is not included in the analyses.

The 5DE is constructed from the weighted summation of the adequacy scores of the ten indicators in the index's five domains. A woman is empowered if she is deemed adequate in four out of the five domains or has a score that reflects at least 80 percent adequacy (Alkire et al. 2012). In this study's sample, the average inadequacy score is 0.34, which is above the inadequacy threshold of 0.20 set by Alkire et al. (2012). Of the 2,405 respondents interviewed about women's empowerment, 1,740 have inadequacy scores above the threshold. In other words, over 72 percent of the women in this study are considered to not yet be empowered. Compared to other African countries where the WEAI survey has been conducted, Ghana has the highest rate of women who are not yet empowered; followed by Liberia and Kenya at 70 percent, and Zambia with 60 percent. At 30 percent, Rwanda has the lowest rate, and Uganda and Malawi have the second and third lowest rates, 42 and 48 percent, respectively (Malapit et al. 2014).

Table 2 provides the criteria used to determine adequacy in the ten indicators. For example, the *production domain* consists of two indicators that evaluate a woman's role in joint and sole decision-making with regards to agricultural practices and autonomy in agricultural product decisions, such as input purchases, livestock and cropping decisions, and whether or not to participate in marketing activities. In the survey, the autonomy questions focus on whether a woman makes a decision that is more in-line with her beliefs and values rather than the desire to please someone or avoid harm, e.g., being coerced into a decision. As measured by the 5DE, women in previous research reported having higher decision-making abilities and autonomy with regard to minor expenditures, health problems, or protection from violence (IFPRI 2012).

The *resource domain* assesses a woman's ownership of, access to, and decision-making authority over resources such as land, livestock, equipment, and credit. Three indicators are included in this domain: (1) ownership of land and other assets; (2) decision-making on land and other

[1] For a complete discussion on the WEAI and pilot applications in various countries, see http://www.ifpri.org/publication/women-s-empowerment-agriculture-index.

assets; and (3) access to credit and decisions about credit. Compared to men, women are more likely to be credit constrained and have higher repayment rates, but choose to invest larger proportions of their resources into the well-being of their children and family (de Aghion and Morduch 2005, Pitt and Khandker 1998). A woman's control and influence over household decision-making processes is positively related to her ability to independently access financial resources (Sharma 2003).

A single indicator comprises the *income domain*, and it measures a woman's input into decisions concerning the use of income generated from agricultural-related activities and non-farm activities. This indicator also measures a woman's perceived control over personal decisions on wage/salary employment and household expenditures. Leadership, in the *leadership domain*, evaluates a woman's involvement in the community, and it is measured by two indicators: her membership in economic and social groups and her comfort speaking in public. These two indicators provide a perspective on a woman's comfort and ability to exert her voice and engage in collective action. The two indicators in the *time allocation domain* measure the time allocated to productive and domestic tasks and the availability of time for leisure activities, such as socializing with friends and neighbors, watching TV, or playing sports. In their 2012 study, Bhagowalia et al. found that women who are not yet empowered faced more time constraints than their counterparts.

Table 2. Adequacy Criteria for the Ten Indicators in the 5DE

Indicator	Adequacy Criteria
Input in productive decisions	A women is adequate if she participates or feels she has input in at least two types of decisions
Autonomy in production	A woman has adequate achievement if her actions are motived more by her values as opposed to her fear of disapproval or feelings of coercion.
Ownership of assets	A woman is adequate if she has joint or sole ownership of at least one major asset.
Purchase, sale, or transfer of assets	One asset owned by a household, a women is adequate if she is involved in the decisions to buy, sell, or transfer assets.
Access to the decisions on credit	An adequate woman belongs to a household that has access to credit and when decisions on credit are made, she has input in at least one decision regarding at least one source credit.
Control over use of income	A woman is adequate if she has some input (or perceived input) on income decisions provided that she participated in the income generating activity.
Group member	A woman is considered adequate if she is a member of at least one group from a wide range of economic and social groups.
Speaking in public	A woman is deemed adequate if she is comfortable speaking in public in at least one context.
Leisure time	A woman has adequate leisure time if she does not express any level of dissatisfaction with the amount of leisure time available.
Work Burden	A woman is considered to have an excessive workload and thus, inadequate if she worked more than 10.5 hours in the previous 24 hours.

Source. Alkire et al. 2012

Demographic and Socioeconomic Variables

The demographic and socioeconomic variables included in the model are income, age, education, and marital status. Per capita daily household expenditure is used as a proxy for income to form income decile groups to address outlier risks. Per capita daily household expenditure is computed based on a composite of four main sub-aggregates of consumption: (1) food items; (2) non-food items; (3) consumer durables; and (4) housing. Food items are comprised of purchased, home produced, and gifts. The monetary value of the home produced and food gifts is imputed using the unit price of the purchased good, provided that the household purchased food as well as consumed home produced and gifted food. In the case where the household did not purchase food but did consume home produced and gifted food, the monetary value of these home produced and gifted food items is based on the median price of food items consumed by similar households in the same district within the survey area. The four main consumption sub-groups are aggregated to estimate the total annual consumption expenditure for each household. That sum is then divided by household size and by 365 days to estimate the per capita daily expenditure.[2] Expenditures are reported in 2010 US dollar equivalents. Definitions for the remaining demographic and socioeconomic variables and the household characteristics are presented in the statistics summary (Table 1).

Analysis and Results

The model is developed and estimated in two specifications. In the first specification, the overall aggregate 5DE, denoted by WEAI inadequacy count, is included in the model to isolate the effect of women's empowerment in agriculture on women's health status. In the second specification, the 5DE is decomposed into its ten indicators to investigate how each of these indicators directly impacts women's health status. As indicated in the methods section, women's BMI and DDS represent the observable endogenous variables determined by the latent variable, health status. In both specifications, individual and household variables are used for control purposes. The final analytic sample is 2,002 women with data on the overall adequacy score (Specification I) and 1,323 women with data on the ten indicators (Specification II).[3]

Prior to estimating the two specifications, correlation analyses were performed to address possible multicollinearity issues between the independent variables in both specifications. In each pairwise comparison, the correlation coefficient is less than 0.60 for Specification I and less than 0.50 for Specification II, implying that multicollinearity is not a large issue in these analyses. Also, the Variance Inflation Factors are less than ten and have a tolerance level greater than 0.10, suggesting that no severe multicollinearity issues are present within the two specifications.

[2] The composite variable for expenditure does not take into account the effect that seasonality may have on consumption patterns.

[3] To assess the possibility of systematic differences between the two samples, Specification I was estimated using the sample size for Specification II (1,323 observations). The results from this estimation were consistent with the results from the original estimation of Specification I using 2,002 observations; thus, providing no evidence of significant systematic differences.

The results from the two specifications are presented in Table 3. The results from the structural model are in the upper panel, and results from the measurement model for the health conditions are in the lower panel. To form the scale of the latent variable, the factor loading of the BMI indicator was set to one.

Table 3. Results of MIMIC Model of Women's Health Status in Northern Ghana

	Specification I				**Specification II**			
Structural Model	Coef.	Stand. Coef.	Stand. Std. Err.		Coef.	Stand. Coef.	Stand. Std. Err.	
Education	0.003	0.089	0.058		0.002	0.047	0.059	
Age (in yrs)	0.001	0.085	0.071		0.000	0.011	0.079	
Marital status	0.003	0.014	0.052		-0.005	-0.020	0.063	
Household hunger scale	-0.018	-0.161	0.055	***	-0.016	-0.158	0.064	**
Income deciles	0.010	0.541	0.070	***	0.010	0.558	0.085	***
Household size	0.002	0.114	0.066	*	0.001	0.092	0.068	
Access to electricity	0.018	0.152	0.064	**	0.007	0.064	0.070	
Private toilet	0.008	0.050	0.054		0.001	0.008	0.061	
Urban locale	0.043	0.337	0.062	***	0.041	0.315	0.067	***
WEAI inadequacy count	-0.015	-0.051	0.058					
Input in productive decisions					0.006	0.060	0.065	
Autonomy in production					0.039	0.339	0.069	***
Ownership of assets					-0.017	-0.164	0.072	**
Purchase, sale, or transfer of assets					0.010	0.093	0.071	
Access to and decisions on credit					-0.026	-0.223	0.061	***
Control over use of income					-0.005	-0.036	0.070	
Group member					-0.018	-0.155	0.057	***
Speaking in public					0.007	0.063	0.064	
Leisure time					-0.019	-0.136	0.056	**
Work burden					-0.006	-0.061	0.062	
Measurement Model								
Log of BMI	1.000	0.339	0.041	***	1.000	0.3239	0.051	***
DDS	11.999	0.404	0.048	***	13.210	0.429	0.056	***
SRMR	0.016				0.014			
R-squared (overall model)	0.749				0.925			
Number of Observations	2,002				1,323			

Notes. *, **, *** denotes significance of standardized coefficients at the ten, five, and one percent levels, respectively. SRMR refers to Standardized Root Mean Squared Residual.

For comparison purposes, the results contain both unstandardized and standardized coefficients. The standardized coefficients are used for ease of interpretation and comparison of variables that are measured in different units. Additionally, the standardized coefficients display the actual weight, or factor loadings, on the BMI indicator that is fixed, i.e., constrained to one in the unstandardized results. In both specifications, probability weights are used to account for differential probabilities of selection and non-responses from the households rendering the

estimation results representative of the population in northern Ghana. When using such probability weights, goodness of fit indicators are given by the Standardized Root Mean Squared Residuals (SRMSR).

In the first specification, the household hunger scale, income decile groups, and urban locale variables are significant at the 1 percent level and have the expected signs. Access to electricity is significant at the 5 percent level, and household size is significant at the 10 percent level. The WEAI inadequacy count is not statistically significant in Specification I.

In Specification II, income and urban locale are significant at the 1 percent level as in Specification I, but household hunger scale is only significant at the 5 percent level. Access to electricity and household size are not significant. Half of the ten indicators in the decomposed 5DE are significant. Three of the indicators are statistically significant at the 1 percent level: autonomy in production, access to and decisions on credit, and group membership. The other two indicators are significant at the 5 percent level: ownership of assets and leisure time.

In the measurement model for both specifications, the coefficients on the latent variable for the health indicators, BMI and DDS, are positive and statistically significant, suggesting a causal structure with the single common latent variable, health status. The R^2 value for the overall model in Specification II is 0.92 implying that nine-tenths of the variance in the latent variable is accounted for by the model's explanatory variables; compared to the lower R^2 value of 0.75 in Specification I. The SRMR score was less than 0.05 for both specifications, indicating a good fit of the model.

Discussion

The results indicate that women's empowerment in agriculture, based on the 5DE index, does not have an impact on women's health status. However, when the index is decomposed into its ten component indicators, five of the indicators exhibit a statistically significant relationship with women's health status: access to and decisions on credit, ownership of assets, autonomy in production, group membership, and leisure time. These results and the direction of the relationship provide some support for our hypothesis that women with a high degree of empowerment have a high health status.

Adequacy in ownership and access to credit have a positive impact on women's health status. This is in-line with findings from previous studies that state that women's relative control over resources has a positive impact on their families' nutrition and health (Thomas 1997, Pitt and Khandker 1998). Owning assets may be a source of confidence for women, giving them increased bargaining power, so they can make better health-enhancing decisions. Women can also use these assets as collateral to secure resources that would increase their health status. These acquired resources may also be used to increase their productivity in income generating activities such as farming and other entrepreneurial activities. In addition, access to credit can enhance a woman's ability to pursue entrepreneurial opportunities. As previous literature has indicated, women's lack of resources is a major constraint on their productivity, despite being as efficient producers as men (FAO 2011). By removing this resource constraint and providing

access to credit, women can procure resources that can effectively enhance their productivity and profitability.

Autonomy in production has a significant relationship with women's health status, and the direction of the relationship is negative. Thus, higher autonomy in production is associated with lower health status. Given the hypothesis that women's empowerment, which includes having autonomy in production, will improve women's health status, the direction of this relationship is unexpected. Further investigation into this variable uncovered a significant, positive association between autonomy and income. That is, a woman in a higher income group has a lower autonomy in production. The direction of this relation is also unexpected. These findings warrant further investigation into the relationship between a woman's autonomy in production and her health status, and between autonomy in production and income.

When looking at the effect of income decile groups on women's health status, the results indicate a significant positive effect. As income increases, a woman's health status increases. The results also indicate that income has the largest impact on women's health status. These findings are consistent with existing literature. An increase in a woman's income implies that she has the financial ability to purchase more nutritious foods for herself and her family and/or pay for the healthcare services that she or her family needs. Rubalcava et al. (2009) discovered that women living in a dual headed household allocated the additional income they received from a cash transfer program to expenditures on improved nutrition, child well-being, and small livestock animals – activities that are within their domain of responsibilities. This finding supports the belief that women are active in caring for and investing in child and household well-being. The foregoing research and the current study's findings validates the development and implementation of numerous income-generating initiatives in developing countries, and particularly in northern Ghana, which focus on shifting individuals and households from lower to higher income decile groups.

The fact that the indicators for group membership and leisure time play a significant role in improving women's health status provides support to Robeyns' (2003) selection of relevant capabilities. In her article, Robeyns expresses the importance of forming nurturing social relationships and enjoying leisure activities as a means for relaxation and fostering creativity. Building social networks and having the freedom to think creatively increases a woman's self-esteem and intrinsic sense of well-being and improves her health status. These social relationships and leisure time also give women resources and capabilities, i.e., mental clarity, strategic partnerships, and social support, to develop strategies to overcome challenges that they face and to maximize opportunities. Membership in agricultural or economic groups provides a woman a forum to voice her opinions, challenge cultural prejudices and misconceptions, and participate in decision-making that can improve her productivity in agricultural-related activities, and ultimately, improve her and her family's well-being.

Incorporating women's views into local decisions is a primary focus for many women empowerment initiatives. In one particular initiative by the World Bank in Burkina Faso, women must provide at least 30 percent of the deciding vote for local decisions (Quisumbing et al. 1995). Being a part of a cooperative, particularly women-formed cooperatives, gives a woman an opportunity to improve their access to transportation, storage markets, and value-added processing. These groups also provide a social network that women can use to build strategic

relationships within and outside their community and improve their position in supply chains by forming partnerships or alliances with downstream supply chain members.

Urban locale also has a significant and large impact on women's health status, which is not unexpected. Women living in urban areas have more access to markets with diverse foods. This is reflected in our study by women living in urban areas having a higher diet diversity score than those living in rural areas. Also expected is the positive impact that the household hunger scale, i.e., having adequate quantity of food to eat, has on women's health status. Both the quality and quantity of the food available to a woman has a positive impact on her health as captured by the significance of the locale and household hunger scale variables. A woman who lives in a household with little to no hunger does not have to spend time, one of her limited resources, searching for and providing food to feed herself and her family. Instead, a woman with a diverse diet and adequate amount to eat, can focus her attention and efforts on developing strategies and investing in entrepreneurial activities to increase her earning potential from both on- and off-farm, income-generating activities.

Conclusions

A substantial amount of attention from the development and agricultural communities has been focused on the importance of empowering women because of their significant role in agricultural production.

However, for women to be effective in their responsibilities, women need to maintain an adequate health status. This study sought to examine the impact of women's empowerment in agriculture on women's health status using data from a 2012 population-based survey from northern Ghana. Results from the study indicate that some of the women empowerment indicators - ownership of assets, access to credit, autonomy in production, group membership and leisure time - have a significant impact on women's health status. Income, urban locale, and household hunger are important socio-economic variables that also have a significant impact on women's health status.

While empowering women is a goal within itself to achieve gender equality, our results indicate that women's empowerment can lead to achieving other development goals through its effect on women's health status, such as gains in human capital formation and improved agricultural productivity. Some key empowerment strategies for improving women's health status and production capabilities include developing initiatives that focus on increasing women's membership in social and economic groups, easing women's access to credit, and increasing women's incomes. Leaders in the agribusiness community, who know and understand these linkages between women's empowerment in agriculture and women's health status, can leverage these relationships and develop gender sensitive policies and programs that will have a positive impact on agricultural productivity and support growth in the agriculture sector.

References

Alkire, S., R. Meinze-Dick, A. Peterman, A.R. Quisumbing, G. Seymour, and A. Vaz. 2012. The Women's Empowerment in Agriculture Index. OPHI Working Paper no. 58. Oxford Department of International Development, Oxford. http://www.ophi.org.uk/wp-content/uploads/ophi-wp-58.pdf. [Accessed April 2013]

Arimond, M., D. Wiesmann, E. Becquey, A. Carriquiry, M. Daniels, M. Deitchler, N. Fanou-Fogny, M. Joseph, G. Kennedy, Y. Martin-Prevel, and L.E. Torheim. 2010. Simple Food Group Diversity Indicators Predict Micronutrient Adequacy of Women's Diets in 5 Diverse, Resource-Poor Settings. *Journal of Nutrition* 140: 20595-20695.

Bhagowalia, P., P. Menon, A.R. Quisumbing, and V. Soundararajan. 2012. What Dimensions of Women's Empowerment Matter Most for Children Nutrition? Evidence Using Nationally Representative Data from Bangladesh. IFPRI Discussion Paper 01192, International Food Policy Research Institute.

Bollen, K. A. 1989. *Structural Equations with Latent Variables*. New York, NY: John Wiley & Sons, Inc.

de Aghion, B.A., and J. Morduch. 2005. *The Economics of Microfinance*. Cambridge, MA: Massachusetts Institute of Technology.

De Schutter, O. 2013. Gender equality and food security: Women's empowerment as a tool against hunger. *Asian Development Bank*. http://www.adb.org/sites/default/files/pub/2013/gender-equality-and-food-security.pdf [Accessed December 2013].

(CDC) Centers for Disease Control and Prevention. 2014. Healthy Weight: Assessing Your Weight: BMI: About Adult BMI. http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html. [Accessed August 2014].

(FAO) Food and Agriculture Organization of the United Nations. 2010. Agricultural value chain development: Threat or opportunity for women's employment? http://www.fao.org/docrep/013/i2008e/i2008e04.pdf. [Accessed August 2014].

____. 2011. The State of Food and Agriculture 2010-11. Women in Agriculture: Closing the gender gap for development. http://www.fao.org/docrep/013/i2050e/i2050e00.htm. [Accessed May 2014].

Ferraro, K. F.,Y. Su, R. J. Gretebeck, D. R. Black, and S. F. Badylak. 2002. Body Mass Index and Disability in Adulthood: A 20-Year Panel Study. *American Journal of Public Health* 92(5): 834–840.

Foote, J., S. Murphy, L. Wilkens, P. Basiotis, and A. Carlson. 2004. Dietary Variety Increases The Probability of Nutrient Adequacy Among Adults. *Journal of Nutrition* 134: 1779-1785.

Haddad, L., E. Kennedy, and J. Sullivan. 1994. Choice of indicators for food security and nutrition monitoring. *Food Policy* 19:329–343.

(IFPRI) International Food Policy Research Institute. 2012. Women's Empowerment in Agriculture Index. *Feed the Future.* http://feedthefuture.gov/sites/default/files/resource/files/weai_brochure_2012.pdf. [Accessed September 2013].

Joreskog, K. G., and A. S. Goldberger. 1975. Estimation of a Model with Multiple Indicators and Multiple Causes of a Single Latent Variable. *Journal of the American Statistical Association* 70 (351):631-639.

Kabeer, N. 1999. Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change* 30(3):435-464. http://onlinelibrary.wiley.com/doi/10.1111/1467-7660.00125/pdf. [Accessed May 2014].

Kennedy, E., and M. Garcia. 1994. Body mass index and economic productivity. *European Journal of Clinical Nutrition*. 48(S3): S45-53.

Kennedy, G., T. Ballard, and M. Dop. 2011. Guidelines for Measuring Household and Individual Dietary Diversity. United Nations, Food and Agriculture Organization: Nutrition and Consumer Protection Division.

Krishnakumar, J. 2007. Going Beyond Functionings to Capabilities: An Econometric Model to Explain and Estimate Capabilities. *Journal of Human Development* 8(1):39-63.

Mabsout, R. 2011. Capability and Health Functioning in Ethiopian Households. *Social Indicators Research* 101:359-389.

Malhotra, A., S. R. Schuler, and C. Boender. 2002. Measuring Women's Empowerment as a Variable in International Development. World Bank, Washington, DC. http://siteresources.worldbank.org/INTGENDER/Resources/MalhotraSchulerBoender.pdf. [Accessed November 2013].

Malapit, H. J., K. Sproule, C. Kovarik, R. Meinzen-Dick, A. Quisumbing, F. Ramzan, E. Hogue, and S. Alkire. 2014. Measuring Progress Toward Empowerment Women's Empowerment In Agriculture Index: Baseline Report. *The International Food Policy Research Institute* http://www.ifpri.org/sites/default/files/publications/weaireport2013.pdf [Accessed September 2014].

Ogle, B. M., P. H. Hung, and H. T. Tuyet. 2001. Significance of Wild Vegetables in Micronutrient Intakes of Women in Vietnam: An Analysis of Food Variety. *Asia Pacific Journal of Clinical Nutrition* 10: 21-30.

Pitt, M., and S.R. Khandker. 1998. The Impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter? *The Journal of Political Economy* 106(5):958-996.

Quisumbing, A.R., L.R. Brown, H. S. Feldstein, L. Haddad, and C. Pena. 1995. Women: The Key to Food Security. Food Policy Statement No. 21, The International Food Policy Research Institute.

Robeyns, I. 2003. Sen's Capability Approach and Gender Inequality: Selecting Relevant Capabilities. *Feminist Economics*. 9(2-3): 61-92.

Rubalcava, L., G. Teruel, and D. Thomas. 2009. Investments, Time Preferences and Public Transfers Paid to Women. *Economic Development and Cultural Change* 57(3): 507-538. http://www.jstor.org/stable/pdfplus/10.1086/596617.pdf?acceptTC=true. [Accessed August 2014].

Sahn, D.E., and S. D. Younger. 2009. Measuring Intra-Household Health Inequality: Explorations Using The Body Mass Index. *Health Economics* 18: S13–S36.

Samman, E., and M. E. Santos. 2009. Agency and Empowerment: A Review of Concepts, Indicators and Empirical Evidence. *Oxford Poverty and Human Development Initiative*. http://www.ophi.org.uk/wp-content/uploads/OPHI-RP-10a.pdf. [Accessed January 2014].

Savy M., Y. Martin-Prevel, P. Sawadogo, Y. Kamel, and F. Delpeuch. 2005. Use of variety/diversity scores for diet quality measurement: relation with nutritional status of women in a rural area in Burkina Faso. *European Journal of Clinical Nutrition* 59:703–16.

Smith, L. C., U. Ramakrishnan, A. Ndiaye, L. Haddad, and R. Martorell. 2003. The importance of women's status for child nutrition in developing countries. Research Report 131, International Food Policy Research Institute.

Sharma, M. 2003. "Microfinance." In *Household Decisions, Gender, and Development*, edited by A.R. Quisumbing, 195-99. Washington, DC: International Food Policy Research Institute.

Spanos, A. 1984. Liquidity as a Latent Variable: an Application of the MIMIC Model. *Oxford Bulletin of Economics and Statistics* 46*:125-143.*

Thomas, D. 1997. Incomes, expenditures, and health outcomes: Evidence on intrahousehold resource allocation. *Intrahousehold resource allocation in developing countries: Models, Methods, and Policy.* Baltimore, Maryland: The Johns Hopkins University Press. p 142-164.

Wells, J.C.K., and M. S. Fewtrell. 2006. Measuring body composition. *Archives of Disease in Childhood* 91:612-617.

(WHO) World Health Organization. 2013. Global Database on Child Growth and Malnutrition. http://www.who.int/nutgrowthdb/estimates2012/en/index.html. [Accessed November 2013].

_____. 2014. Global Database on Body Mass Index. http://www.who.int/mediacentre/factsheets/fs311/en/. [Accessed August 2014].

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

A Case Study of Shuanghui International's Strategic Acquisition of Smithfield Foods

Hongjun Tao[ⓘa] and Chaoping Xie[b]

[a] *Associate Professor, Department of Trade and Economics, School of Economics and Management, Fuzhou University, Shangjie, Minhou, Fuzhou, Fujian Province, People's Republic of China, 350108*

[b] *Doctoral Student and Research Assistant, Department of Agricultural and Applied Economics, 320 Hutcheson Hall, Virginia Tech, 250 Drillfield Drive, Blacksburg, Virginia, 24061, USA*

Abstract

Pork consumption accounts for more than 60% of total meat consumption in China. China's rapid economic growth, expanding middle class and continuous urbanization is increasing the demand for pork and importance in stabilizing China's pork market. This also creates an opportunity for foreign pork producers to export more pork to China. How can this be done? Foreign direct investment is one solution when trade barriers exist. This case study explores the reasons why China's Shuanghui International acquired the U.S. based, Smithfield Foods. Analysis shows that the success of the two companies' merger depends upon the establishment of an efficient transnational pork supply chain. This case study can be used for Bachelor of Science and Master of Science students in international economics, agribusiness and agricultural marketing courses. It will also be helpful to business managers who want to export more agricultural goods to China.

Keywords: pork, foreign direct investment, acquisition, U.S. and China agricultural trade, supply chain

ⓘCorresponding author: Tel: + 86.13774512403
Email: H. Tao: 1602696171@qq.com
C. Xie: xiecp@vt.edu

IFAMA Agribusiness Case 18.1A

This case was prepared for class discussion rather than to illustrate either effective or ineffective handling of an agribusiness management situation. The author(s) may have disguised names and other identifying information presented in the case in order to protect confidentiality. IFAMA prohibits any form of reproduction, storage or transmittal without its written permission. To order copies or to request permission to reproduce, contact the IFAMA Business Office. Interested instructors at educational institutions may request the teaching note by contacting the Business Office of IFAMA.

"The new combined company expects to meet the growing demand for pork in China by exporting high-quality pork products from the U.S. This means more production for U.S. producers, more jobs in processing and more exports for the American economy."

C. Larry Pope, President and CEO, Smithfield Foods

"Shuanghui will gain access to high-quality, competitively-priced and safe U.S. products, as well as Smithfield's best practices and operational expertise. We were especially attracted to Smithfield for its strong management team, leading brands and vertically integrated model. "

Wan Long, President and CEO, Shuanghui International

Introduction

On September 26, 2013, Smithfield Foods merged with its Chinese counterpart, Shuanghui International. To acquire Smithfield, Shuanghui International paid $7.1 billion (all values are in U.S. dollars), including $4.7 billion for Smithfield shareholders, and $2.4 billion for Smithfield debt owners. This transaction is the largest foreign direct investment in the U.S. by a Chinese firm to date and gives rise to concerns and curiosities.

The acquisition may seem strange at first glance. Smithfield Foods is the world's largest hog raiser and pork producer. In 2013, the company ranked 213 on the Fortune 500 list with its $13.2 billion sales. It has a long history of 77 years with 12 different product brands. Although Shuanghui International is registered in Hong Kong, this company actually operates in Mainland China. In 2012, the sales value of Shuanghui International was only $6.3 billion, less than half of Smithfield's. Yet, Shuanghui acquired Smithfield.

A concern about this foreign direct investment is that it was coming from China. Although China has carried out opening up and reforming policies for 35 years—since 1978, its economic system is still quite different from that of the United States. Even today, the U.S. has not recognized China as a market economy. Opponents of the acquisition accuse Shuanghui of being a state-owned company which is heavily subsidized by China's government and some Americans question whether the acquisition is dangerous to U.S. food security. Michigan Senator, Debbie Stabenow (Stabenow 2013) asked the following two questions during a hearing held specifically for Shuanghui's acquisition of Smithfield.

1. Why did Shuanghui need to acquire Smithfield when in 2012 Shuanghui sold less than half of Smithfield's sales?

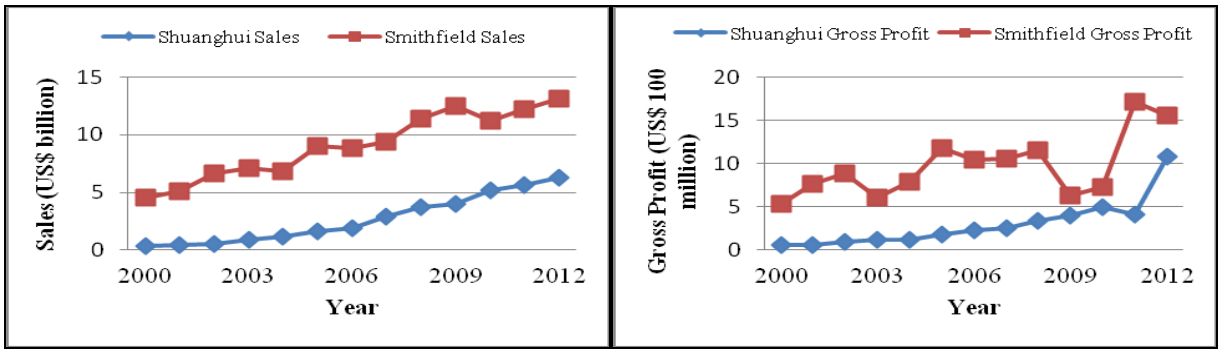
2. Why did Smithfield need to sell itself to Shuanghui when Smithfield was doing well?

This case study aims to explain the reasons why firms choose to invest abroad by analyzing Shuanghui's acquisition of Smithfield. Additionally, readers will gain deeper insight into the function, definition, key determinants, and success of foreign direct investment (FDI).

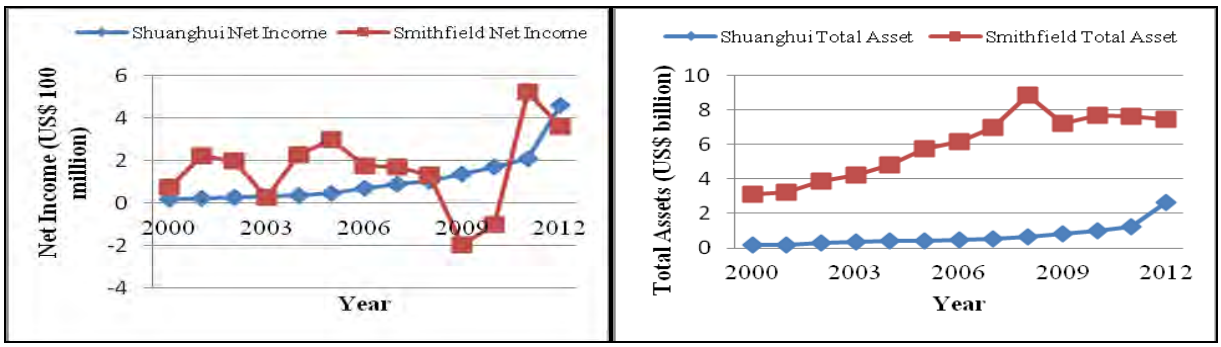
Comparison of Smithfield Foods and Shuanghui International

Shuanghui is Smaller than Smithfield

In 2000, respective sales, gross profit, net income and total assets of Shuanghui were only 8.3%, 10.4%, 24.2% and 6.0% of Smithfield's. Shuanghui's business grew faster than Smithfield's during 2000-2012. For 2012, respective sales, gross profit, net income and total assets of Shuanghui had risen to 47.7%, 69.9%, 126.5% and 35.6% of Smithfield's. Smithfield's net income was negative in 2009-2010, but recovered in 2011. Shuanghui had consistent net income growth during 2000-2012 (see Figure 1A, B, C, and D).



A. Sales **B. Gross Profit**



C. Net Income **D. Total Asset**

Figure 1. Selected Financial Indicators of Shuanghui and Smithfield—A. Sales; B. Gross Profit; C. Net Income; D. Total Asset.

Note. Fiscal year of Shuanghui is from January 1 to December 31, while fiscal year of Smithfield is from April 1 to March 31. Shuanghui's financial indicators were converted to U.S. dollars with Renminbi's exchange rate with U.S. dollar on July 1 of each year during 2000-2012.
Source. Annual Report of Shuanghui Development (2000-2012) from Shenzhen Stock Exchange, Smithfield Integrated Report 2013 (2004-2012 data), Smithfield Foods Annual Report (2000-2003 data).

Between 2000 and 2012, sales, gross profit, net income and total assets of Smithfield grew at a moderate geometric mean of 9.3%, 9.4%, 14%, and 7.5%, respectively. Smithfield pork business was healthy when it merged with Shuanghui. Meanwhile, respective sales, gross profit, net income and total assets of Shuanghui grew at a faster geometric mean of 26.4%, 28.2%, 30.8%, and 24.7% in the same period.

Though Shuanghui does own hog production operations, the company's competitiveness exists in pork processing and distribution. On the contrary, Smithfield is not only the world's largest pork processor, but also the world's largest hog producer (Smithfield Press Release Archive 2013d). Its contract model of hog production, which is able to supply sufficient and safe pork to China's market, attracted Shuanghui to Smithfield (Smithfield Press Release Archive 2013e).

Steady Growth of Smithfield Foods

Smithfield Foods is the world's largest pork producer and processor. Headquartered in Smithfield, Virginia, it runs facilities in 26 U.S. states. It also has operations in Mexico and in 10 European countries, with a global total of 47,000 employees (Smithfield Press Release Archive 2013a). Murphy-Brown, a subsidiary of Smithfield, produces approximately 16 million hogs annually on its U.S. company-owned and contract farms. Eight U.S. fresh pork processing plants of Smithfield produce more than 1.7 million metric tons of fresh pork annually (Smithfield Press Release Archive 2013b).

Smithfield is also the leader in numerous packaged meats categories with popular brands (see Exhibit 2). It is committed to providing good food with six pillars of sustainability: animal care, employees, environment, food safety and quality, helping communities, and value creation (Smithfield Integrated Report 2013).

As a vertically integrated company, Smithfield is dedicated to supplying the domestic and international markets with quality products by improving its supply chain (see Exhibit 3). 50% of Smithfield's pork is free of the feed additive ractopamine (Smithfield Press Release Archive 2013c). It is legal to use ractopamine in the U.S. pork industry, while in China the government banned the use of ractopmine in hog production in 2002. For fiscal year 2013, Smithfield sales value reached $13.2 billion, 1% higher than the prior year, with a net income of $183.8 million.

Rapid Growth of Shuanghui International

Shuanghui International owns a variety of global businesses that include food, logistics, and flavoring products. Shuanghui International and its subsidiaries are the majority shareholders of China's largest meat processing enterprise, Henan Shuanghui Development (Shuanghui International Press Release 2014). Henan Shuanghui Development is a publicly traded meat processing company headquartered in Luohe, Henan province, P.R.China. It is the largest pork producer in China. This company's departments include hog production, pig slaughtering, pork processing, fresh meat and packaged meat distribution (see Exhibit 1). The president and CEO of Shuanghui International, Mr. Wan Long, is nicknamed "China's number one butcher."

In 2012, Shuanghui slaughtered 11.4 million hogs and processed 1.6 million metric tons of meat, increasing by 14.1% and 6.4%, respectively from 2011. Today's Shuanghui has its roots in Luohe Slaughterhouse, a state-owned firm that went bankrupt in 1984. Mr. Wan Long reorganized assets of the company and transformed the state-owned firm to a private one. In the mid 1980s, annual sales of Shuanghui were less than $1.7 million. Since the late 1980s, Shuanghui has witnessed rapid business growth. Annual sales reached $17 million in 1990, $1.7 billion in 2003 and $6.3 billion in 2012.

In China's pork industry, Shuanghui's competitors include Yurun, Delisi and a few other companies. Shuanghui has devoted itself to the pork industry and does not currently invest in more profitable real estate businesses. In 2012, the turnover of Yurun was $3.5 billion, which was 45.1% less than Shuanghui's sales value. In the same year of 2012, Delisi sold $31.3 million pork products to the market and accounted for 5% of Shuanghui's market share only. Shuanghui Development has 61,050 employees and a state-of-the-art meat research center. Dedication pays off. Shuanghui has already become the largest hog production and pork processing company in China. In the first half of 2013, the net income of Shuanghui business increased by 59.1%.

Pork Production and Consumption in Mainland China

Since 1984, Shuanghui has run a successful pork business and its net income always grew at a two digit rate. Why does Shuanghui need to acquire Smithfield when it is already doing well in China? The pork business of Smithfield still earns acceptable profits and operates on a sustainable basis. Why does Smithfield need to sell itself to Shuanghui? Answers to these two questions partly lie in the status quo of pork production and consumption in China and the United States.

Production-China is the World's Largest Pork Producer

China has a long history of hog production. Pork always accounts for the highest proportion of China's meat production (Li 2013). In 2012, China's total meat output was 83.8 million metric tons. Respective output of pork, beef, mutton, and poultry were 53.4, 6.6, 4.0, and 18.2 million metric tons. In the same year, China's beginning stock for hogs was 467.7 million head, and ending stock was 474.9 million head. China slaughtered 696.3 million head of pigs in 2012 (China's Statistical Yearbook 2012). Only China, EU-27 and the U.S. can produce more than 10 million metric tons of pork annually. In 2012, the world pork output was 105.7 million metric tons. China, EU-27 and the U.S. approximated 49.6%, 21.3% and 10% of the world production, respectively. China produced as much as five times the pork as the United States and 2.3 times the pork as the European Union (USDA Foreign Agricultural Service data 2013a).

Consumption-China is the World's Largest Pork Consumer

China's pork consumption is greater than pork production and China needs to import pork from the international market. In 2012, China's carcass weight pork production was 52.4 million metric tons, which was 0.3 million metric tons lower than its pork consumption. Since pork

consumption approximates 65% of total meat consumption in China, it becomes a political and public concern to stabilize the pork market. All in all, pork is the main meat protein source for the 1.35 billion Chinese populations. With income increases, annual per capita pork consumption continues to grow in China.

Since liberation (October 1, 1949) to the late 1980s, most of the Chinese people were too poor to afford pork and the annual per capita pork consumption was less than 10 kilograms in this period (Li et al. 2011). Thanks to its economic success, Chinese pork demand has risen dramatically from the 1990s to date. At the same time, China is currently experiencing a rapid process of urbanization. Around 15 million farmers ceased farming and migrate to the cities every year. Per capita pork consumption of urban residents is greater than rural residents in China, due to a dual economy. In 2011, urban residents on average consumed 20.6 kilograms of pork, while per capita pork consumption of rural residents was only 14.4 kilograms this year (see Figure 2). While urbanization continues in China, richer urban consumers will demand more pork.

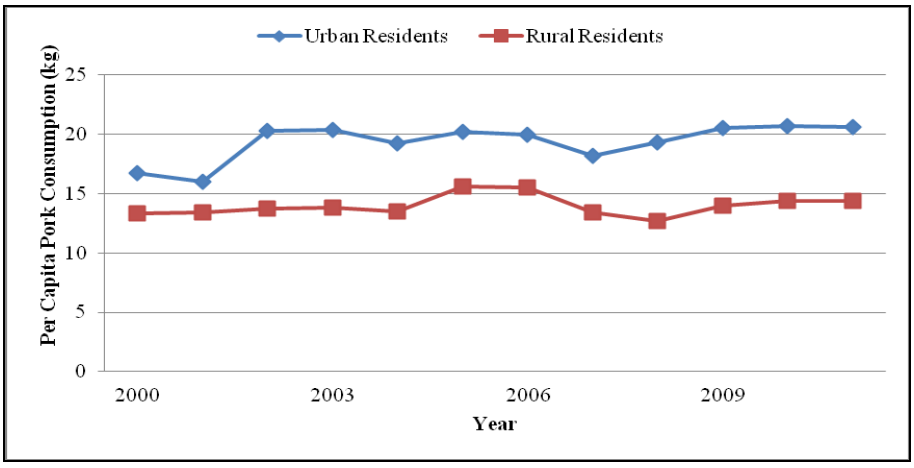


Figure 2. Per Capita Pork Consumption of China's Urban and Rural Residents.
Source. China's Statistical Yearbook, 2012.

In 2012, total pork consumption of the world was 105.1 million metric tons. The largest three markets for pork are: China, EU-27, and the United States. Consumers in these three countries consumed 52.7, 20.4 and 8.4 million metric tons of pork respectively in 2012. Also in 2012, China's pork consumption was 50.2% of the world's total, 6.3 times that of the United States. Both EU-27 and the U.S. consumed less pork in 2012 than previous years, but China consumed more pork. China's pork consumption in 2012 was 8% greater than in 2009, while pork consumption of the U.S. and EU-27 in 2012 was 6.8% and 3% less than in 2009 (USDA Foreign Agricultural Service 2013b).

China's Pork Market is Volatile

Pork price peaks appeared in 2013 during the Spring Festival (February 9) and the Middle Moon holiday (September 19). In the summer, the Chinese consumed less pork because of hot weather and hog and pork prices dropped to their lowest points. Hog and carcass pork prices in one week before the 2013 Spring Festival went up to $2.6 and $3.6 per kilogram. At this time, hog prices

were 11.1% higher than hog prices in the summer and carcass pork prices were 13.5% higher. Hog and carcass pork prices in the week before the Middle Moon holiday rose to $2.6 and $3.5 per kilogram. Again, these prices were 11.1% and 10.1% higher than summer prices. Though hog and pork prices moved up and down frequently, sow prices, which can be taken as one of the hog production cost indicators, were quite stable. China's pork industry suffers from price volatility and often brings about public concerns. Between October 24, 2012 and October 23, 2013, weekly hog and pork prices fluctuated in China's market (see Figure 3).

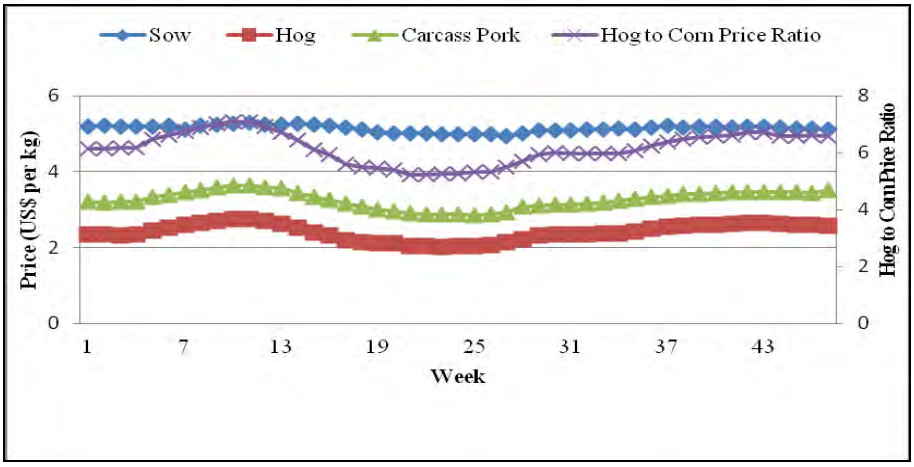


Figure 3. China's Weekly Pork Price during October 24, 2012 - October 23, 2013.
Note. Data covered 46 weeks between October 24, 2012 and October 23, 2013. Seven weeks data are missing.
Source. China's pork market monitoring reports.

In May of 2012, the National Development and Reform Commission of China's State Council, together with five other departments, renewed a 2009 plan to control cyclical hog price volatility. The new plan continued the policy of setting up a national pork reserve system and tried to keep the hog to corn price ratio around 7.5:1, at which a Chinese hog producer can earn $32 per hog. Once the hog to corn price ratio is smaller than 6:1 or greater than 8.5:1, the government will interfere with the pork market by utilizing the national pork reserve system.

China's Pork Trade

Mainland China exports its pork to Hong Kong, Kirghizstan and Macau. Meanwhile, China's pork imports are concentrated in the U.S., Denmark and Germany. These countries are the three largest sources for China's pork imports. In 2012, 71.1% of China's pork imports are from the above mentioned three countries.

China's pork imports fluctuated more frequently than exports, depending on domestic production and consumption. In 2007, China imported 854.2 thousand metric tons of pork, which was 7.0 times of its exports. Between 2008 and 2011, China's pork imports fell. In 2012, China's pork imports surged to a historical high of 1.4 million metric tons. Before 2007, China typically had a pork trade surplus. From 2007 to 2012, China has been a net pork importer (see Figure 4).

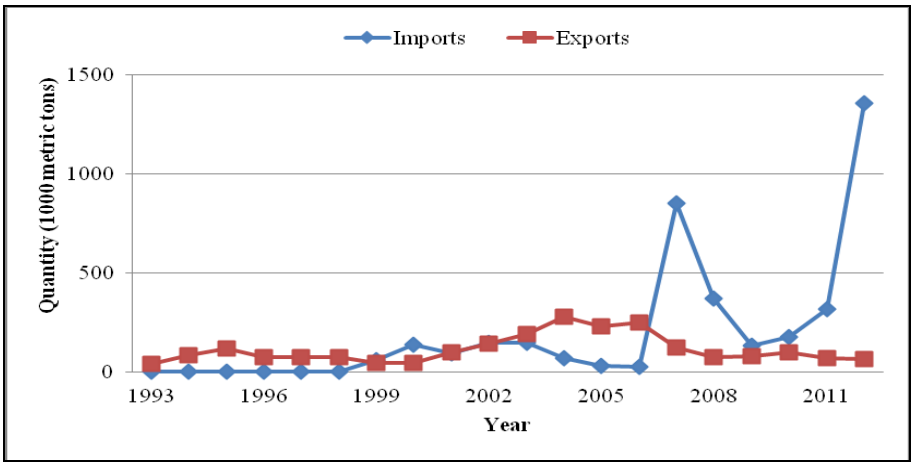


Figure 4. China's Pork Trade (carcass weight).
Source. Agricultural Trade Statistics of China's Ministry of Commerce.

Pork Production and Consumption in the U.S.

Production - U.S. is the World's Third Largest Pork Producer

Since 2000, U.S. pork production has been increasingly greater than its pork consumption and the U.S. needs to export its pork surplus to the international market. Pork ranks third in U.S. meat output, next to (1) poultry and (2) beef and veal. In 2012, U.S. total meat output amounted to 42.0 million metric tons. Poultry, beef and veal, pork and mutton and lamb output in 2012 were 19.8, 11.7, 10.5 and 0.07 million metric tons, respectively.

"U.S. hog production consolidated considerably as fewer and larger farms accounted for an increasing share of total output. From 1992 to 2009, the share of U.S. hog inventory on farms with 2,000 heads or more increased from less than 30% to 86%. Since 1992, the use of production contracts has increased dramatically" (McBride and Key 2013).

Farm Gate Price of Pork is Low

Between 2000 and 2012, the net farm and wholesale value of pork grew in the U.S.at a very slow rate. The retail price of pork outpaced the net farm and the wholesale value. The gap between the pork retail price and farm gate price widened in the U.S. over time (see Figure 5).

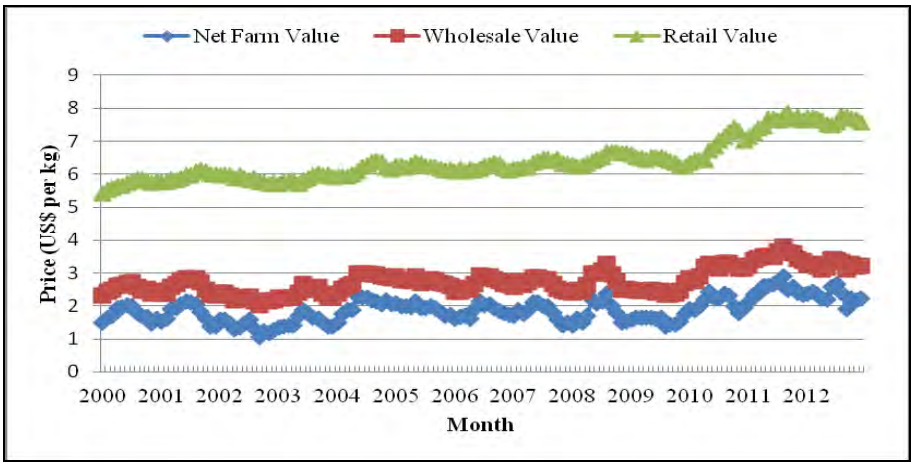


Figure 5. Monthly Net Farm, Wholesale and Retail Pork Prices in the U.S.
Source. USDA, ERS Data 2012.

In January 2000, the retail value of pork was $5.4 per kilogram. This shows a difference of $3.1 per kilogram between retail price and wholesale price, along with a $3.9 per kilogram difference between retail value and net farm value. In December 2012, the retail value of pork was $7.6 per kilogram. This shows a difference of $4.3 per kilogram between retail price and wholesale price, along with a $5.3 per kilogram difference between retail value and net farm value. If U.S. hog farmers can export more pork to the high-priced international market, their incomes will increase.

U.S. Pork Consumption Tends to Decrease

Pork also ranks third in U.S. annual meat consumption, following beef and chicken (Daniel et al. 2011). In 2009, Americans ate 9.0 million metric tons of pork while in 2012, they only consumed 8.4 million metric tons of pork. Pork consumption took a 6.8% decrease from 2009 to 2012.

Per capita pork consumption decreased continuously from 29.9 kilograms per person to 26.9 kilograms per person. “The Continuing Survey of Food Intakes by Individuals (CSFII) indicates that rural consumers eat more pork than urban/suburban consumers. Higher income consumers tend to consume less pork. Everything else remaining constant, demographic data in the CSFII suggest future declines in per capita pork consumption. Americans tend to consume less pork in away-from-home markets and reduce pork consumption as they age. As Hispanics become a larger population, their lower per capita consumption of pork will bring down total per capita pork consumption.” (Daniel et al. 2011).

U.S. Pork Trade

The U.S. has a comparative advantage of hog production over its competitors. Large scale production and rich feed corn resources bring about lower production costs and prices. U.S. live weight producer pork price was $1440.0 per metric ton in 2011, which was 20.4% lower than China's producer pork price and 169.9% lower than Japan's producer pork price. China's live weight producer price in 2006 was only $811.5 per metric ton, but dramatically changed to $1814.5 per metric ton in 2007. Lower pork prices ensure competitiveness of U.S. pork industry

and its share in the international pork market to increase. U.S. pork exports started in 2000 and they grew fast. At the same time, the U.S. exports much more pork than it imports. Over the period of 2000-2012, U.S. pork imports decreased and exports as a share of traded goods increased (see Figure 6).

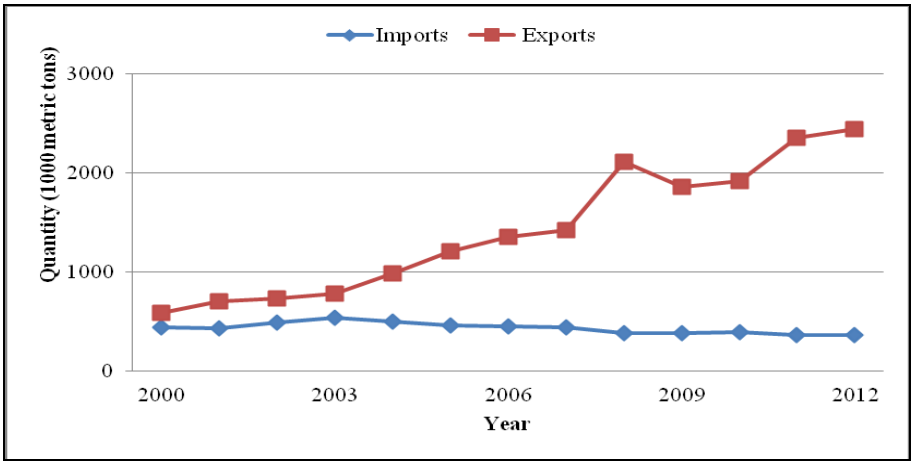


Figure 6. U.S. Pork Trade (carcass weight).
Source. USDA, ERS Data 2012b.

The U.S. primarily exports pork to Japan, Mexico, Canada, South Korea and China. Japan is the largest pork export market for the United States of America. During 2000-2012, U.S. pork exports to these five countries generally increased. In 2012, China surpassed Canada to become the third largest export market for the U.S. pork industry, while its pork imports from the U.S. varied dramatically (see Figure 7).

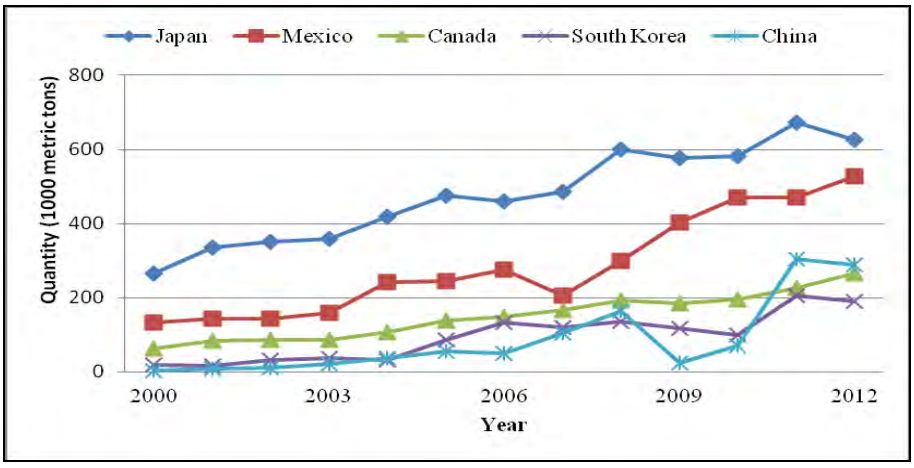


Figure 7. U.S. Pork Exports to its Top Five Markets (carcass weight).
Source. USDA, ERS Data 2012c.

The U.S. exports a large portion of its pork output. Between 2000 and 2012, U.S. pork production and exports increased substantially. Production rose by about 2.0 million metric tons over this period and much of this rise was exported. Annual pork exports changed from about 0.6

million metric tons in 2000 to 2.4 million metric tons in 2012. Exports represented, on average, about 6.8% of production in 2000, but about 23.1% of production in 2012. China's pork imports from the U.S. grow fastest, but are unstable.

The U.S. and China Pork Trade

High unit production costs, epidemic animal diseases, hog manure disposal challenges and food safety scandals are obstacles to hinder China's pork production. China does not possess abundant arable land to produce feed corn. The purchasing power of the Chinese population is increasing. The richer Chinese need more pork to consume simply because they had less pork to eat in the poor old times. In Chinese recipes, pork is the most important food. Famous pork dishes such as Dongpo Elbow (Dongpo Zhou Zi), Double Cooked Pork Slices (Hui Guo Rou) and Yu Xiang Shredded Pork (Yu Xiang Rou Si) attract Chinese consumers deeply, including those who became rich. So it is very promising that the U.S. will export more pork to China. For the U.S. pork industry, China has been one of the leading export markets since 2007. In 2012, U.S. pork sales to China accounted for 7.5% of U.S. total pork exports and 1.7% of U.S. pork production, but only about 0.3% of China's total pork consumption. U.S. pork exports to China will increase greatly, if the U.S. pork industry can gain free access to China's pork market.

In 2012, monthly retail pork prices in China averaged $4.1 per kilogram, only 53.7% of the retail pork prices in the U.S. market. Average U.S. farm gate and wholesale pork prices were $2.3 per kilogram and $3.2 per kilogram in 2012, which was 77.6% and 26.6% lower than retail prices in China. Thus, pork price margins exist between the pork markets of China and the United States. Pork price differences across the two nations will encourage more U.S. pork exports to China.

Except for price difference, consumption preferences also affect U.S.-China pork trade. Chinese consumers use virtually all pork parts, while U.S. consumers eat muscle meat only. For example, some Chinese think pig's intestines are more delicious than muscle meat. Many elderly and sick Chinese also think pig's feet are more nutritious than other meat types. For a worship ceremony of a Chinese family, a pig's head is a necessary sacrifice in some rural areas of China.

"In 2011, the average U.S. prices of livers, hearts, hocks, feet, kidneys and tails were less than half the prices of corresponding parts in a Beijing wholesale market. Variety meats constitute most of U.S. pork exported to China, but the widening difference in prices improves the prospects for U.S. muscle meats to be competitive in China." (Gale et al. 2012). In 2013, China imported $1.1 billion carcass pork, $1.5 billion pork by-products. If China balances its imports of carcass pork and pork by-products, it will import more pork from the U.S. and benefit U.S. pork producers.

Challenges of China's Pork Industry

Rising Costs

Feed corn prices in China have been rising due to cropland scarcity and vigorous demand for grain by feed mills and industrial users, e.g. distillers. Chinese hog producers and feed mills pay much higher prices for corn than their U.S. counterpart do. In recent years, rising feed corn prices have pushed China's feed expenses higher. Rising feed prices tend to propel hog and pork prices upward as well. During October 2012 to October 2013, the feed corn price in China was

around 2.4 yuan per kilogram ($0.4/kg). With continuing appreciation of Renminbi (domestic Chinese currency), China's feed corn price in U.S. dollars rose slightly by 2.8% in the 12-month period in China (China Corn Price Statistics). On the contrary, feed corn (No.2 white, Kansas City, MO) prices reduced by 44.6% in the U.S. in the same time period. In October 2013, the feed corn price in China was 2.1times of the feed corn price in the United States (see Figure 8). Feed corn prices in China will continue to be higher than feed corn prices in the U.S. if we don't take adverse weather conditions and bio-fuel production into considerations.

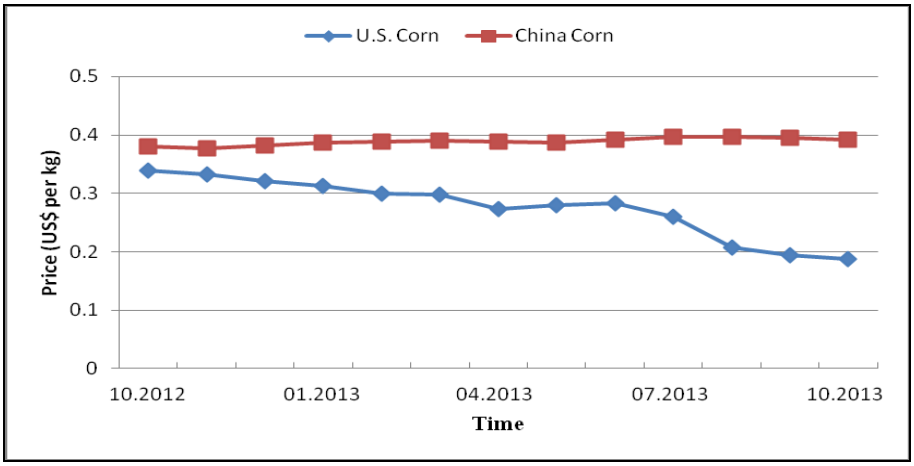


Figure 8. Monthly Feed Corn Prices in China and U.S.
Source. USDA ERS feed grain data 2013, China corn price statistics.

Small Scale Production

*Trad*itionally, Chinese farmers fed hogs in the backyard. In a self-subsistence economy, a young farmer would be laughed at by neighbors if he or she did not own a backyard hog pen. Today the situation has changed. Most of young villagers work in the cities and stop feeding hogs in the backyards of their homes as their parents did in the past. Diminishing backyard hog production does not mean that large scale hog production is occurring. Governmental officials realize that small scale hog production impedes technology progress, productivity increase and cannot ensure food safety and pork market stability (China's 12th Five-year Pork Industry Plan). Local governments welcome new investors to enter into their pork market. China's No.1 feed producer New Hope Group and No.2 real estate developer Hengda Group started their pork businesses in 2006 and 2014 respectively. Small scale production of China's pork industry might last for a long time even large firms invest in this industry.

China's National 12th Five-year Food Industry Plan encourages slaughterhouse mergers and acquisitions and aims to reduce the number of small scale slaughterhouses by 50% by 2015. Meanwhile, the National 12th Five-year Meat Industry Plan aims to upgrade China's meat production structure. According to this plan, by 2015, fresh and chilled meat will be 30.0% of the total pork sales in Chinese cities, while processed meat will be 17.0% of total sales. Ironically, some small slaughterhouses and pork processors seek protection from local governments by not allowing large pork distributors to enter into the local market. On October 3, 2013, a newly opened chain store of Shuanghui was vandalized by local competitors in Yiyang County, Jiangxi

province. The chief instigator of the incident was an official of the local government. Shuanghui sued the local government. Finally, criminals were arrested.

Epidemic Diseases

Large losses attributed to epidemic diseases periodically restrict the supply of pork and contribute to price surges. China does have animal quarantine and inspection organizations. Veterinary services are also available for hog farms. Nevertheless, outbreaks of blue ear disease, foot-and-mouth disease, classical swine fever, pneumonia, streptococcus suis, circovirus, parasites and erysipelas are often reported by the media. Experts point out that Chinese hog farms are in delicate balance in controlling epidemic diseases (Hu and Zhang 2013). Lag in phase of early warning systems, vaccine misuse, lack of antibodies' uniformity, negligence of nutrition's role in immunity and overuse of antibiotics are typical problems of epidemic disease control and prevention in Chinese hog farms.

Environmental Stress

Hog production brings about environmental stress in China. One hog produces around 5.5 kilograms of waste per day, which contains large amounts of nutrients not absorbed by the animal as well as heavy metals and pharmaceutical residues. A hog can only absorb 40% of copper, zinc, and iron metals of feed, while 60% of them will be excreted into the environment. In an anaerobic condition, hog waste decomposition releases unpleasant gases such as ammonia, hepatic gas, methyl mercaptan, trimethylamine, volatile organic acid, indoles, skatole, ethanol, and acetaldehyde. These odors pollute air and water environment (Liu et al. 2011). China's annual hog waste is about 1.3 billion metric tons, which is 47% of the total livestock and poultry waste generated. Livestock waste, including hog waste, is the main source of water pollution in rural areas (China's Environmental Bulletin 2012).

China's government subsidizes hog farmers to construct biogas tanks to manage hog waste. In large hog farms, biogas programs are usually successful. How to distribute and utilize huge tons of biogas slurry and residue is still a big challenge. In some small hog farms, animal waste is treated recklessly and some is directly poured into the environment.

Food Safety and Consumer Confidence

Food safety is also a major concern for Chinese pork consumers. In the recent years, food scandals have reduced consumers' confidence with Chinese food safety. The media in China reported the illegal use of clenbuterol, ractopamine, and other illegal feed additives in Henan province in 2011. Walmart was involved in China's food scandals also. In September 2011, Walmart angered its Chinese consumers by selling around 30 metric tons of fake organic pork. In May 2013, the police in Fujian province arrested criminals that processed sick and dead hogs. Ironically, sausages made from these sick and dead hogs passed the quality and quarantine inspection of a local sanitary agency. "Chinese consumers are also becoming more wary of pork products that contain dyes, preservatives, and other food additives." (Woolsey and Zhang 2011). In March 2011, Shuanghui was reported to have slaughtered hogs containing clenbuterol and ractopamine by China's Central Television (CCTV). It caused disastrous effects on consumers' confidence in the pork industry. Shuanghui is the largest pork producer, but its pork product is

contaminated by illegal feed additives. What other pork producers have done the same without the public's knowledge? A household survey showed that a sampled family did not consume pork at all in the first week after the scandal. During March 16-25, Shuanghui slaughtered 61.6% less hogs and sold 71.6% less pork than the previous week (Zeng 2011).

Why Not Trade Instead of Acquisition?

China has many difficulties in continuing to increase its pork production, but China's pork consumption growth will not cease. The Chinese population is sure to grow in the future since there is a social pressure to abandon the "one family, one child" policy. Middle class Chinese refuse to pay for expensive, yet unsafe pork products and pursue higher quality imported pork. The U.S. has stricter environmental regulation, nicer hog producing and processing facilities, more advanced hog waste disposal technologies and a well-developed contract model of hog production as compared to China. All in all, the U.S. has both natural endowment advantage and productivity comparative advantage over China in pork production. Under such circumstances, what is the reason for Smithfield to sell itself to Shuanghui, not considering stock share premium for shareholders?

Pork Trade Barriers Exist between China and the U.S.

Is it difficult for Smithfield to access China's market? The American pork industry and American government are concerned with China's unwillingness to open its pork market. The U.S. International Trade Commission reported that China's non-tariff barriers particularly its sanitary and phytosanitary measures have a larger effect on U.S. exports (Okun et al. 2011). Interestingly, China's Ministry of Commerce also blamed the U.S. to adopt antidumping and technical barriers to deter agricultural imports from China.

China restricts pork imports with tariff and non-tariff barriers. (1) China's most favored nation (MFN) ad valorem tariff rates for fresh pork, chilled pork and chilled pork by-products are 20%, frozen pork and frozen pork by-products are 12%. These tariff rates are higher than 8.5% average MFN tariff rate for agricultural imports of the nation. (2) Since March 1, 2013, China's quality inspection and quarantine authority requires pork importers to offer costly third party certifications, which caused a 70% decrease of U.S. pork exports to China. (3) China forbids use of ractopamine in pork production, but the U.S. allows pork producers to use this feed additive with a maximum 50 ppb residue limit. (4) China bans pork imports from five states of the U.S. on July 5, 2009 for a year over a brief H1N1 influenza scare though this epidemic disease has nothing to do with pigs.

Smithfield's Pork Exports – Room to Grow in China

Smithfield is the world's largest hog producer and pork processor. Its unit pork production costs are low due to lowly priced feed input and large scale production. It has advanced pig waste disposal technologies to ensure the least possibility of polluting the environment. Its contract model of hog production stabilizes the company's hog supply and reduces farmers' risk. Pork products are differentiated and the company enjoys a large market share in the U.S., Japan and Europe. Though hog production is less profitable than pork processing for Smithfield, it is a necessary part of its supply chain and very valuable to companies such as Shuanghui. The pork

supply chain of Smithfield is more efficient than the competitors, except it can only gain access to the world's largest pork market, China, on a limited basis (See Figure 9).

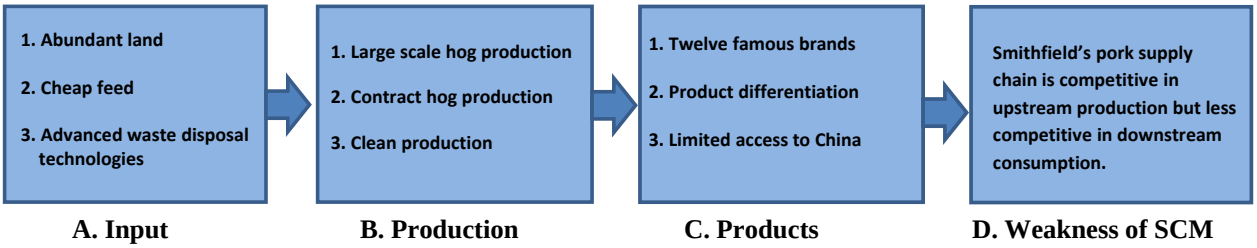


Figure 9. Less Developed Pork Supply Chain of Smithfield before Acquisition.

China's government provides domestic pork producers with financial support. Before acquisition, Smithfield could not compete fairly with Shuanghui and other pork producers in China's market. In 2012, Shuanghui received $44.8 million in financial support from the central and local governments, which was 0.7% of its annual sales. It included $11.0 million for sick and dead hog culling, $52,438.0 for sow production, $112,904.0 for artificial insemination, $72.9 million for large scale production, $42,672.0 for pork logistics, $22.2 million for tax rebate, and $4.1 million for other purposes (Shuanghui Annual Report, 2012).

Shuanghui's Pork Supply Chain - Not a Competitive Hog Producer

Presently, Shuanghui has three hog breeding farms and four commercial hog farms. In 2013, Shuanghui raised 330,000 hogs, but it slaughtered and processed 13.31 million hogs. It can only raise 2.5% hogs that the company needed, and had to purchase nearly 13 million hogs from other domestic hog farms. So, Shuanghui's advantage lies in hog slaughtering, pork processing and pork distribution. It is not a competitive hog producer.

Shuanghui wanted to rehabilitate its reputation by raising more company-owned hogs after the 2011 scandal, but hog production is costly, risky and it's too late to invest in this Chinese industry. Most of the local governments in China welcome Shuanghui's pork logistics service and pork processing operations, but say no to the plan of erecting new hog farms. To the contrary of its 2011 announcement, Shuanghui does not expand its hog raising business greatly, but invests more in raising chickens. Chicken raising causes less environmental stress than hog and requires less feed input. Presently, Shuanghui cannot rely heavily on other Chinese domestic hog farms. The current contract model of hog production is not popular and Chinese hog farms are usually small. It is hard to ensure a safe upstream hog supply. If only one upstream hog farm is reported to utilize illegal feed additives, the reputation of Shuanghui will be ruined. The 2011 scandal is a good lesson for Shuanghui (See Figure 10).

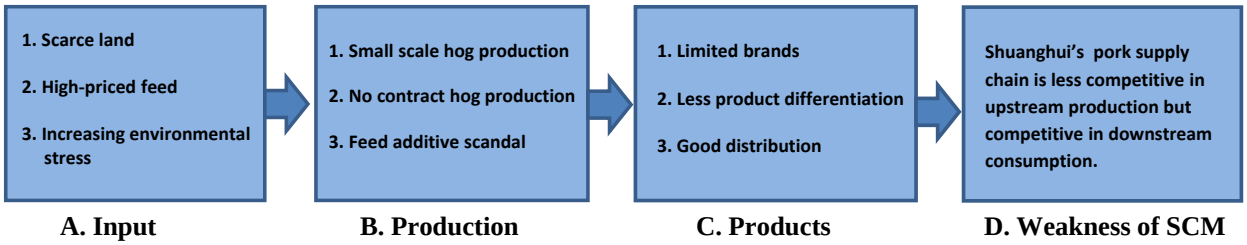


Figure 10. Less Developed Pork Supply Chain of Shuanghui International before Acquisition.

Shuanhui Establishes a Complete and Efficient Pork Supply Chain after Acquiring Smithfield

Small scale production has been a source of food scandals. So, domestically, China's government encourages agglomeration in the pork industry to ensure food safety. Shuanghui follows the government's advice and acquired many small slaughterhouses in different regions of China. It has established an extensive distribution network in China's domestic market.

Over production of hog farming is not environmentally sustainable. It might threaten national food security by squeezing land and water resources for grain production. So, internationally, China's government encourages acquisition of foreign pork producers by investing abroad. By acquiring Smithfield, Shuanghui will supplement its strengths and complement its weaknesses with Smithfield (See Figure 11).

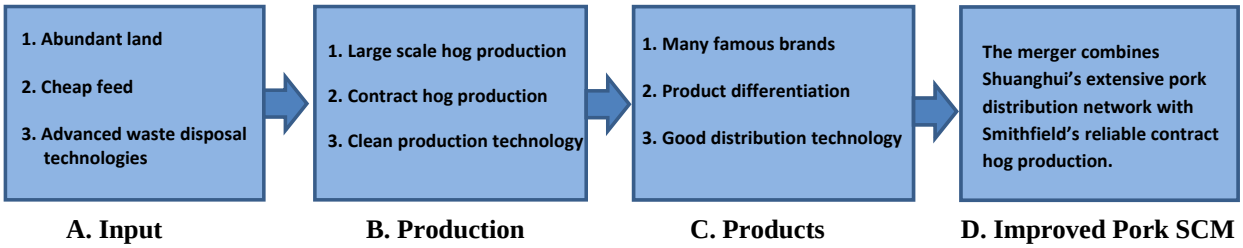


Figure 11. Well-Constructed Pork Supply Chain of the New Combined Shuanghui-Smithfield.

After acquiring Smithfield, Shuanghui takes advantage of Smithfield's contract model of hog production and connects with more than 2,000 U.S. hog farms. Before the acquisition, Shuanghui did not diversify its products. With Smithfield pork brands, Shuanghui will satisfy the growing Chinese middle class demand and achieve a higher market share in high-end pork consumption. Alternatively, Shuanghui will own Smithfield's hog production and pork processing technologies. These technologies will make Shuanghui more competitive in China's market. With Smithfield's clean production reputation, Shuanghui will win higher Chinese consumer confidence.

Acknowledgements

This case study is financially assisted by the Visiting Scholar Program of the Education Department of Fujian Province, People's Republic of China. The authors are grateful to Mr.

Steven. C. Blank for his arrangement of an office for writing. Miss Stephanie Hedrick and Miss Liz Kersteter offered warm help during research. The authors also thank nine coaches from the Writing Center of the Virginia Tech library for their excellent work. Miss Cheyenne Cline patiently helped review the case study.

References

Daniel, Carrie R., AJ. Gross, C. Koebnick, and R.Sinha. 2011. Trends in Meat Consumption in the USA. *Public Health Nutrition* 14(4):575-83.

Gale, F., D. Marti, and D. Hu. 2012. China's Volatile Pork Industry. USDA Economic Research Service. LDP-M-211-01. http://www.ers.usda.gov/media/262067/ldpm21101_1_.pdf [accessed October 31, 2013].

Hu, L., and J. Zhang. 2013. Who Broke the Delicate Balance in China's Hog Farms? *Pigs Today* 2013(2):17-22.

Li, G. 2013. China's Hog Production and Policy. *Swine Industry Economics* (2): 16-19.

Li, X., Y. Zhao, and C. Chen. 2011. Analysis of the Characteristics and Development Trend of China's Pork Consumption Market. *Soft Science* 25(3): 88-94.

Liu, L., C. Fan, and L. Chen. 2011. Environmental Pollution Risk of Hog Farms in Guizhou Province. *Guizhou Agricultural Science* 39(2):165-168.

McBride, William D., and N. Key. 2013. U.S. Hog Production from 1992 to 2009: Technology, Restructuring, and Productivity Growth. USDA Economic Research Report (ERR-158). http://www.ers.usda.gov/media/1207987/err158.pdf[accessed October 30, 2013].

Ministry of Commerce of the People's Republic of China. 2011. China's 12th Five-year Pork Industry Plan. http://www.doc88.com/p-973391618210.html [accessed November 28, 2013].

Ministry of Commerce of the People's Republic of China. 2013. Agricultural Trade Statistics. http://www.wms.mofcom.gov.cn/article/ztxx/ncpmy/ncpydtj/200603/20060301783733.shtml [accessed November 25, 2013].

Ministry of Environmental Protection of the People's Republic of China. 2012. China's Environmental Bulletin. http://www.mep.gov.cn/gkml/hbb/qt/201407/W020140707496640197649.pdf [accessed December 5, 2013].

National Bureau of Statistics of the People's Republic of China. 2012. China's Statistical Yearbook: Animal Husbandry Production. http://data.stats.gov.cn/ workspace/index?m=hgnd [accessed October 25, 2013].

National Development and Reform Commission of the People's Republic of China. 2013. China's Pork Market Monitoring Reports. http://www.gov.cn/zfjg/szsctk.htm [accessed November 18, 2013].

Okun, Tanner D., Irving A. Williamson, Charlotte R. Lane, Daniel R. Pearson, Shara L. Aranoff, and Dean A. Pinkert. 2011. China's Agricultural Trade: Competitive Conditions and Effects on U.S. Exports. Investigation No. 332-518. USITC publication 4219. www.usitc.gov/publications/332/pub4219.pdf [accessed November 10, 2013].

Pope, Larry C. 2013. Testimony in the Hearing Titled "Smithfield and Beyond: Examining Foreign Purchase of American Food Companies". www.ag.senate.gov/hearings/smithfield-and-beyond_examining-foreign-purchases-of-american-food-companies [accessed October 26, 2013].

Shenzhen Stock Exchange. 2013. Shuanghui Development Annual Report 2012. http://disclosure.szse.cn/finalpage/2013-05-09/62472535.PDF[accessed November 30, 2014].

Shuanghui International Press Release. 2014. Shuanghui International Changes Name to WH Group. http://file.irasia.com/listco/hk/whgroup/press/p140121.pdf [accessed February 27, 2014].

Smithfield Foods. 2013. Smithfield Integrated Report. http://www.smithfieldfoods.com/media/39099/smithfield-integrated-report2013.pdf [accessed November 15, 2013].

Smithfield Press Release Archive. 2013a. Shuanghui International and Smithfield Foods Agree to Strategic Combination, Creating a Leading Global Pork Enterprise. http://investors.smithfieldfoods.com/releasedetail.cfm?ReleaseID=767743 [accessed October 20, 2013].

Smithfield Press Release Archive. 2013b. Smithfield Foods to Reaffirm Benefits of Shuanghui-Smithfield Transaction for U.S. Agriculture Industry. http://investors. smithfieldfoods.com/releasedetail.cfm?ReleaseID=776255 [accessed October 20, 2013].

Smithfield Press Release Archive. 2013c. Shuanghui International and Smithfield Foods Receive CFIUS Clearance.http://investors.smithfieldfoods.com/releasedetail.cfm?ReleaseID=789378 [accessed October 21, 2013].

Smithfield Press Release Archive. 2013d. Smithfield Foods Shareholders Approve Strategic Combination with Shuanghui International.http://investors.smithfieldfoods.com/releasedetail.cfm?ReleaseID=792937 [accessed October 21, 2013].

Smithfield Press Release Archive. 2013e. Shuanghui International and Smithfield Foods Complete Strategic Combination, Creating a Leading Global Pork Enterprise. http://investors.smithfieldfoods.com/releasedetail.cfm?ReleaseID=793522 [accessed October 28, 2013].

Stabenow, D. 2013. Opening Statement in the Hearing Titled "Smithfield and Beyond: Foreign Purchases of American Food Companies". www.ag.senate.gov/hearings/smithfield-and-beyond_examining-foreign-purchases-of-american-food-companies [accessed October 26, 2013].

U.S. Securities and Exchange Commission. 2004. Smithfield Foods Annual Report to Security Holders. http://www.sec.gov/Archives/edgar/vprr/04/9999999997-04-042413[accessed October 10, 2013].

USDA ERS.2012a. Pork Values and Spreads. http://ers.usda.gov/data-products/meat-price-spreads.aspx [accessed November 20, 2013].

USDA ERS. 2012b. Hogs: Monthly U.S. Trade- All Months and Countries. http://ers.usda.gov/ data-products/livestock-meat-international-trade-data.aspx [accessed November 20, 2013].

USDA ERS. 2012c. Rising Prices and Costs for Chinese Pork. www.thepigsite.com/ articles/ 3838/rising-prices-and-costs-for-chinese-pork[accessed November 15, 2013].

USDA ERS. 2013. Feed Grains: Yearbook Tables. http://www.ers.usda.gov/data-products/feed-grains- database/feed-grains-custom-query.aspx[accessed December 10, 2013].

USDA Foreign Agricultural Service data. 2013 a. World Leading Pork Consumers and Consumption.www.fas.usda.gov/data/search?f%5B0%5D=field report [accessed October 26, 2013].

USDA Foreign Agricultural Service data. 2013 b. Livestock and Poultry: World Markets and Trade.http://usda01.library.cornell.edu/usda/current/livestock-poultry-ma/livestock-poultry-ma-11-08-2013.pdf [accessed November 5, 2013].

Woolsey, M., and J. Zhang. 2011. U.S. Pork Exports to China on the Rise. USDA GAIN Report Number: CH11020. http://gain.fas.usda.gov/Recent%20GAIN%20Publications/ Voluntary%20Report_Beijing_China%20-%20Peoples%20Republic%20of_5-5-2011.pdf [accessed December 12, 2013].

Zeng, G. 2011. Impact of Ractopamine Incident on Henan Pork Industry. *China Price* (2): 31-36.

Exhibit 1. Selected Products of Shuanghui International

Spicy Sausage

Mushroom Sausage

Pig's Head

Meat Flavored Sausage

Taiwan Recipe Sausage

Streaky Pork

Sausage

Ribs

Source. The website of Shuanghui Development (shuanghui.net/html/category/food/2, shuanghui.net/html/category/food/4, shuanghui.net/html/category/food/5).

Exhibit 2. Selected Products of Smithfield Foods

Bacon

BBQ

Breakfast Sausage

Cooked Diner Sausage

Ham

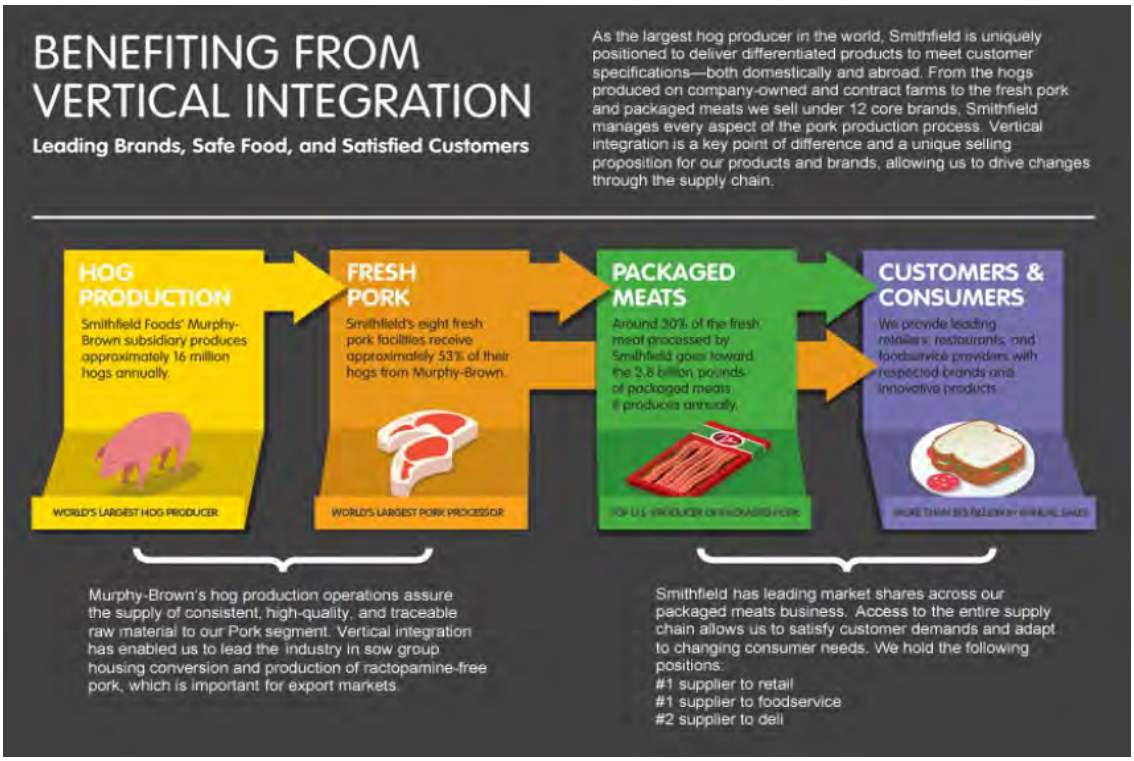
Hot Dogs

Lunch Meat

Marinated Pork

Source. The website of Smithfield Foods (smithfieldfoods.com/our-brands/our-products/).

Exhibit 3. Vertically Integrated Value Chain of Smithfield Foods



Source. The website of Smithfield Foods (smithfieldfoods.com/).

International Food and Agribusiness Management Review
Volume 18 Issue 1, 2015

The Case of Strategic Management and Marketing Consulting for ATO: Doing Business in Tajikistan

Brian K. Coffey

Lecturer of Economics, Keiin Institute of Business and Sciences,
2A Nekrosova Street, Ivanovka, Kyrgyzstan

Abstract

This case offers students the simulation of providing consulting to a small, newly-formed and struggling dairy processor in the developing country of Tajikistan. The task is to conduct a profitability analysis using data provided by the firm. This can be accomplished by calculating the contribution margin of each product and estimating monthly break-even production levels for various scenarios. The information, combined with the background provided in the case, can be used to develop marketing and production strategies. Completing this analysis requires working with imperfect data and making appropriate assumptions. The case highlights the reality of challenges faced by small-scale agribusinesses in emerging economies.

Keywords: profitability analysis, emerging economies, strategic management

ⓘCorresponding author: Tel: + 996.556.08.26.00
Email: B. K. Coffey: brian.coffey@keiin.kg

IFAMA Agribusiness Case 18.1B

This case was prepared for class discussion rather than to illustrate either effective or ineffective handling of an agribusiness management situation. The author(s) may have disguised names and other identifying information presented in the case in order to protect confidentiality. IFAMA prohibits any form of reproduction, storage or transmittal without its written permission. To order copies or to request permission to reproduce, contact the IFAMA Business Office. Interested instructors at educational institutions may request the teaching note by contacting the Business Office of IFAMA.

Introduction

Azam is the founder of a small, newly-formed dairy processing firm located in the Sughd region of northern Tajikistan. He has hired you as a business consultant to evaluate the firm and help him map out a plan for the future. Scheduling a meeting with Azam was not easy. He answered his cell phone in the delivery truck and had to yell to be louder than the traffic noise. He had been at the plant to oversee the morning production run and left shortly after that to deliver products around the city and to outlying villages. He repeats this harried schedule several times each week. He finally makes it back to the plant to meet with you in the afternoon. The two of you sit on metal chairs in a small office with no air-conditioning. By the time the tea comes, you are ready to move outside and continue the conversation.

Source. Reprinted with permission from Nations Online Project**:** Nationsonline.org
Note. The city referred to in the case study is Khujand.

Background Information

Azam worked for several years for the largest dairy processor in the Sughd Region of Tajikistan. He learned about the technical side of making many dairy products. After some time, he decided he wanted a business of his own and set out to create his own brand of dairy products. His aunt was willing and able to finance a large portion of the business through personal investment and

taking out two loans in her name. She has little or no knowledge of dairy processing but trusts Azam and wants to be part of the business. They jointly agreed to call the company "ATO"[1] and they began operations about one year ago. They both see the business as an opportunity to provide healthy food to their local community. Azam traveled to China and brought back processing equipment. Capital outlays for setting up the plant were estimated to be $120,000 USD. This is a major investment in Tajikistan where half the population lives in absolute poverty and per capita Gross National Income (GNI) is about $800 USD (at the time of this investment). It is estimated that a million citizens of Tajikistan (most of whom are young, energetic men like Azam) have migrated from Tajikistan to Russia in order to find jobs. In Russia, these migrant workers take on menial labor and endure harsh working conditions. The specific case of ATO is small in scale but the concept of developing successful small to medium enterprises that add value to commodities has significant implications for providing domestic jobs in Tajikistan and increasing standard of living.

The plant has sufficient equipment to process about five metric tons of raw milk per day. Presently, their production levels are far below capacity. They only accept and process milk every other day. There are many obstacles keeping ATO at this low level of production. Competition is a major challenge. Many dairy processing firms have appeared due to the increased domestic demand for dairy products. Tajik people see dairy products as natural and healthy. Raw milk has recently become the fifth most valuable agricultural commodity produced in Tajikistan. Azam estimates that in the Sughd Region there are at least ten dairy processors. Almost all of these are larger than ATO. The largest processor, for which Azam worked, is also the most well-known among consumers and among dairy farmers. They are able to buy much of the milk from the surrounding towns and villages. ATO, on the other hand, has struggled with both the quantity and quality of their milk supply. Production and sale of raw milk is very fragmented. Independent agents collect milk from households and sell it to dairy processors. Many households are milking less than ten cows. ATO buys milk collected by these independent agents. There are also internal challenges. Utilities, especially electricity, can be sporadic. Power cuts, scheduled and unscheduled, often delay production or result in spoiled products. ATO rents a production facility that was established decades ago when the area was part of the Soviet Union. Refrigeration systems work but require frequent maintenance. As Azam tells you more, you gain a fuller understanding of how challenging the business environment is.

Azam's aunt has grown impatient to see profits. She wants to ensure that ATO is profitable and has assumed the role of plant manager. She will focus on quality control and operations. Profitability is, so far, a nebulous concept due to the disarray of financial records. Azam spends so much time and energy selling and delivering products that he has no time left for record keeping or even basic financial analysis. Azam knows that ATO is not making money but he has no idea how much it is losing or what it will take to see a profit.

Data for Prices, Costs, and Input Requirements

With a good understanding ATO's history, you delve into the technical and financial side of the business. Information from financial records and employee interviews yield average levels of monthly fixed costs (Table 1).

[1] Ato is a Persian word that is loosely translated as "a gift from God".

Table 1. Monthly Fixed Costs for ATO

Expense	Tajik Somoni*	US Dollars
Rent	950	200.00
Electricity	1,100	231.58
Diesel Fuel	1,650	347.37
Coal	520	109.47
Daily Lunch**	500	105.26
Water	60	12.63
Cleaning Equipment	250	52.63
Automotive Costs	500	105.26
Plant Maintenance	500	105.26
Lab Equipment	100	21.05
Taxes	1600	336.84
Regulatory Expenses	650	136.84
Employee Salaries**	4,750	1000.00

Note. *At the time of this case 1 US Dollar = 4.75 TJS
**In a continuation of Soviet tradition, lunch is provided for all employees each day. Employees work on the basis a monthly salary.

A review of the firm's data reveals the per-unit costs of raw milk, other inputs, and packaging materials (Table 2).

Raw milk is processed differently to arrive at different end products. Two issues that affect all products are level of milk fat and waste. On average, the level of fat in raw milk purchased by ATO is about 3.6%. However, the level of fat in the milk is not consistent across seasons and is often undesirably low. This inconsistency affects the consistency and quality of ATO products. Regardless of how the milk is processed, about 2% is wasted through spillage or other mistakes. Specialized processing requirements result in different variable costs for each ATO product.

Table 2. Cost of Milk, Additives, and Packaging Materials

Material	Price in TJS*	Price in US Dollars	Units
Milk	1.5	0.32	L
Powdered Milk	30	6.32	kg
Stabilizer	35	7.37	kg
Bacteria Culture			
for kefir	78	16.42	package**
for sour cream	60	12.63	package**
Fat Additive	14.25	3.00	kg
Seasoning for Dughob	0.05	0.01	enough for 0.9L of dughob
Plastic Container			
200 g	0.24	0.05	one container
400 g	0.29	0.06	one container
Foil Lid	0.07	0.01	one lid
0.5L Soft Pack	0.09	0.02	one pack
1L bottle	0.52	0.11	one bottle
0.9L bottle	0.53	0.11	one bottle
ATO Label	0.06	0.01	one label

Sour Cream

Even the richest milk received by ATO has inadequate fat to result in thick, appealing sour cream. They must add fat. Given the earlier assumption about level of milk fat, they add 114 kg of fat per metric ton[2] of raw milk if it is to be made into sour cream. To make the texture of the product more desirable powdered milk and stabilizer are both added at the rate of 1% of the raw milk to which it is added (e.g., 10 g per 1000 L). This means that 1000 L of raw milk results in more than 1000 L of sour cream. Bacteria are needed to culture the sour cream and are added during the processing at the rate of one package per metric ton of milk. Sour cream is sold in 200-gram and 400-gram containers. Each container has the ATO brand printed on it and requires a foil lid.

Kefir

Kefir is a product similar to yogurt but is thinner and is served as a drink in Tajikistan. Kefir also requires bacteria to ferment but it is not necessary to add additional fat. Powdered milk and stabilizer are added in the same proportions as they are for sour cream. Kefir is sold in 0.5 L soft packs and 1.0 L bottles. Soft packs have the ATO brand name and logo printed on them. ATO purchases clear plastic bottles and affixes an ATO label on them.

Dughob

Dughob[3] is a slightly spicy dairy drink. It is processed by simply adding water and seasoning to kefir. One liter of prepared kefir will yield 1.8 L of dughob. Dughob is sold in special 0.9 L bottles. The bottles are plain and an ATO label is pasted on during processing. ATO dughob is fairly popular among local men. However, it is a seasonal product. People only drink it during the hot summer months of July and August.

Table 3. Wholesale Prices of ATO Products

Product	TJS	US Dollars
200g Sour Cream	1.55	0.33
400g Sour Cream	2.55	0.54
0.5L Kefir	1.65	0.35
1.0L Kefir	3.00	0.63
Dughob (0.9L)	3.00	0.63

Debt

The two loans Azam's aunt has taken on total $40,000 US. The economic climate in Tajikistan is such that cost of capital is quite high. She was able to borrow $25,000 US at 25% annual interest with a 24-month payback period. She then borrowed $15,000 US from a different lender at 27.48% annual interest to be paid back over the next 18 months. Borrowing capital seemed necessary to buy equipment and get started. However, the monthly payments (Tables 4 and 5) are now a strain on cash-strapped ATO.

[2] A metric ton of milk weighs 1000 kg. Though not exact, it is common to assume the volume of a metric ton to be 1000 L of milk.

[3] Dughob is the Tajik name for a dairy beverage very similar to *ayran,* which is extremely popular in Turkey and among Turkic peoples around the world.

Table 4. Repayment Schedule for Two-Year $25,000 Loan

Month	Principle Payment	Interest Payment	Total Payment
1	0	521	521
2	1,086	521	1,607
3	1,086	498	1,584
4	1,086	476	1,562
5	1,086	453	1,539
6	1,086	430	1,516
7	1,086	408	1,494
8	1,086	385	1,471
9	1,086	362	1,448
10	1,086	340	1,426
11	1,086	317	1,403
12	1,086	295	1,381
13	1,086	272	1,358
14	1,086	249	1,335
15	1,086	227	1,313
16	1,086	204	1,290
17	1,086	181	1,267
18	1,086	159	1,245
19	1,086	136	1,222
20	1,086	114	1,200
21	1,086	91	1,177
22	1,086	68	1,154
23	1,086	46	1,132
24	1,086	23	1,131

Table 5. Repayment Schedule for Eighteen-month $15,000 Loan

Month	Principal Payment	Interest Payment	Total Payment
1	0	344	344
2	0	344	344
3	787	344	1,130
4	805	325	1,130
5	823	307	1,130
6	842	288	1,130
7	861	269	1,130
8	881	249	1,130
9	901	229	1,130
10	922	208	1,130
11	943	187	1,130
12	964	166	1,130
13	986	144	1,130
14	1,009	121	1,130
15	1,032	98	1,130
16	1,056	74	1,130
17	1,080	50	1,130
18	1,110	25	1,361

Sales and Marketing

After getting a feel for the operations of the business, you talk with Azam about how he markets and sells ATO products. Presently, ATO products are sold through a local supermarket chain (four or five stores throughout the city of Khujand) and a handful of small, independent shops. These connections have been made mainly through Azam's network of friends. Some of the store owners have become irritated by the inconsistent supply and the varying quality of products. Azam is working to convince them that ATO will improve in these areas. However, most clients are reticent to make big orders.

Due to the competitiveness of the market for dairy products and very low brand awareness of ATO among consumers. Consumers of dairy products in Tajikistan largely view these products as commodities and will readily substitute among brands based on price. Azam has simply priced his products at the levels of his competitors. Local shops apply a standard mark-up to all the products and they are sold alongside other local brands. Earlier, you explored local stores and noticed ATO products stacked erratically in coolers, mixed with other brands, and sometimes even hidden by other products. When you ask Azam about this he says he has seen it too but has little bargaining power with the stores to change the situation.

Planning for the Future

A review of the firm's data shows that, on average, ATO processes 20,500 L of raw milk per month (Table 6). Azam indicates that he knows production must increase but does not have a clear understanding of exactly how much milk he needs to process to be profitable. It is obvious that he feels a lack of control of the business. He is working daily. Money is going out and coming in but Azam does not have an idea of the net profit or loss that is coming from the effort. He wants you to provide some objectivity in determining whether ATO can be profitable. Another factor is the relationship with his aunt. It seems she has lost patience with the idea of investing. Azam needs to be able to show here where the business is going and how ATO can be profitable. He needs some concrete data to help him plan his next steps.

Table 6. ATRO Production Levels for a Typical Month

Product	**Raw Milk Used (L)**
200g Sour Cream	3,000
400g Sour Cream	2,500
0.5L Kefir	7,000
1.0L Kefir	8,000
Dughob (0.9L)	0*
Total Raw Milk	20,500

Advising ATO

As Azam's management consultant, it is your task to give him the information he needs to accurately assess the health of ATO and make decisions about how to go forward. As a starting point identify:

1. The returns over variable cost for each product
2. Returns over all costs for a typical month of production
3. The quantity of milk the ATO must process in a month to break even

Once you have the break-even analysis completed, use it to give Azam a plan for the future. Help him to think more broadly in terms of how he can expect to compete in the market he has entered. Offer tactical advice regarding targeting the right products on which to focus. In terms of marketing, what are some simple, inexpensive steps ATO could take? What other advice do you have for ATO?

IFAMA Business Office • 1010 Vermont Ave., Suite 201 • Washington DC, 20005, USA

Tel: 1-202-429-1610 • Fax: 1-202-530-0659 • E-mail: ifamr@ifama.org • Web: http://www.ifama.org

The IFAMR (ISSN #: 1559-2448)