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International Food and Agribusiness Management Review

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International Food and Agribusiness Management Review

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EDITOR'S NOTE

Dear Colleagues,

This is the final issue of 2015.

It has been another great year for the IFAMR! We published 58 articles in 2015 and have already received 200 articles submitted for peer review as of October 31. Last year we didn't hit this 200 mark until December 26, so we are nearly two months ahead of the 2014 totals. Nice! A higher level of submissions reflects the greater demand to be published in the IFAMR, a broader awareness of the journal, and it allows us to be more selective.

We published a great Special Issue in 2015 edited by a team from USDA-ERS on the global poultry trade and have two Special Issues publishing in 2016—one on the global dairy trade and the other on the tangible applications of Big Data in agriculture. The Big Data issue is edited by a great industry-academia team that will unveil the publication during the annual IFAMA meeting in Aarhus, Denmark, June 19-23. If you have an interest in putting together and editing a Special Issue, drop me an email or skype (pgillinois).

Finally we have a great lineup of twelve articles in Volume 18 Issue 4: ten research manuscripts and two teaching case studies. This issue not only reflects the IFAMR's great tradition of research and teaching cases (check out our large online open access Library of Teaching Cases, including Teaching Notes), but the breadth of IFAMR's focus on management problems, whether at a farm level, industrial level, or concerning the consumer stages of the global food and agribusiness value chain.

P.S. Hey, don't forget to submit a paper for the 2016 Best Paper competition at the annual conference in Aarhus, next June. Get a fast track review process, feedback to improve both the paper and presentation, big awards if you win, and publication in the IFAMR's September conference edition.

Enjoy the issue.

Peter Goldsmith, Executive Editor, IFAMR

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Organic Producers Perspectives on California State Mandated Marketing Programs and Implications for a Federal Organic Promotion Order

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Abstract

This research examines the role of government mandated marketing programs in promoting certified organic produce in California. Data were gathered from public documents, interviews, focus groups, and an industry-wide survey. We find that most California mandated marketing programs minimally address organic production. Regarding the value of generic promotion, slightly more than one-third of the survey respondents indicated that they believed that their mandated marketing program's promotion efforts increased the sales of their organic products. Two options were highly ranked as alternatives to promote organic products, setting aside a representative amount of the marketing program's funds for the promotion of organic produce and establishing a non-governmental producer association to promote all organic produce.

Keywords: government mandated marketing program, marketing order, check-off, produce, organic, commodity promotion

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Introduction

Marketing orders, marketing commissions, and other government mandated marketing programs, which we collectively refer to as GMMPs, have long enabled growers to band together to pool resources for the purpose of funding research and promotion or to establish quality standards in a cost-effective manner that would be difficult or impossible to accomplish individually. Debate over GMMPs has arisen when the interests of the GMMP's members diverge. In the case of organic growers, a major issue is whether they derive sufficient benefits from the GMMP to justify the mandatory assessment. Moreover, organic growers may derive fewer or different benefits than do conventional growers. Carman et al. (2004), in a study of the impact of federal marketing orders on almonds, kiwifruit, and winter pears, found that organic growers undoubtedly benefit from marketing orders. However, they also reported that organic growers are asking whether the benefits exceed the costs of the program and whether organic producers would be better off with a program that specifically promoted organic products.

The U.S. organic industry has experienced rapid growth over the last two decades. Growth has brought many positive changes to the industry, including greater access to markets, buyer loyalty, and diversified product lines. The expanding market has also brought increased competition, a proliferation of alternative labels, and marketing challenges. Our research focuses on one of these marketing challenges, the mandatory assessments associated with agricultural GMMPs. The mandatory assessments are intended to eliminate "free riders" by ensuring that all producers who stand to benefit from marketing programs pay their fair share. However, the flip side of the mandatory assessment is that many organic growers are dissatisfied because they believe that a portion of the assessment should be used to specifically promote the organic product.

We begin the paper with a brief overview of the U.S. organic produce industry and GMMPs. We then describe the specific objectives of this research and the methods we employed. The subsequent sections present the results of the research, our discussion and interpretation of the results, and our conclusions.

U.S. and California Organic Produce Industry

In 2012, the U.S. organic food market was valued at $28 billion, and represented over 4% of all U.S. food sales (USDA, ERS 2013). The 2012 Census of Agriculture shows organic farm sales in California of approximately $1.36 billion out of total state farm sales of $42.63 billion, or roughly 3.2% (USDA, NASS 2014). Since the establishment of national standards in 2002, the industry has experienced rapid growth, although growth slowed during the recessionary period of 2009 to 2010 (Organic Trade Association 2012). Organic growers have benefited from the trend toward healthy eating, a growing concern for chemicals and animal drugs in the food supply, consumers' desire to avoid GMOs, and concern for the environment.

Despite continued growth, organic producers experience challenges with marketing their products and sustaining industry growth. Although the growth rate of organic sales has far outpaced that of conventionally produced products, it still represents just a small fraction of total food sales. One challenge is undoubtedly price; organic marketers must work to justify the price premiums that are typically charged for organic products. Lack of awareness of what organic means is another issue, as one-third of consumers have little knowledge of organic standards

(Organic Trade Association 2013). An emerging concern is the proliferation of alternative labels, such as eco-, GMO-free, natural, and sustainable. For example, 20% of consumers believe that a product labeled as "natural" contains certified organic ingredients (Pure Branding, Inc. 2011). Consumer confusion over the meaning of organic and other terms presents a challenge to organic growers who incur increased costs to comply with government standards for organic products.

Organic foods are regulated in the U.S. under the Federal Organic Foods Production Act (OFPA) of 1990. This act was passed with the intent to establish uniform national standards for the production and marketing of organic foods, most of which were previously certified by one or more of many private organizations and/or state agencies. The provisions of OFPA resulted in the establishment by the USDA of the National Organic Program in 2000 and the implementation of national standards in 2002.

Over the last decade, organic food products have become mainstream in many respects, both in market growth and channel development. As previously noted, the growth in organic foods has greatly exceeded the growth rate of the food industry as a whole. Sales have risen from approximately $1 billion in 1990 (Organic Trade Association 2011) to approximately $28 billion in 2012 (Figure 1), (USDA, ERS 2013). Organic products may be purchased in nearly 20,000 natural food stores and almost three-fourths of conventional grocery stores (USDA, ERS 2014a). According to the USDA's *2011 Organic Production Survey*, market channels for organic growers include 6% consumer direct sales, 13% direct-to-retail sales, and 81% wholesale market sales (USDA, NASS 2012). California organic food sales mirrored that of the nation with 6% consumer direct sales, 12% direct-to-retail sales, and 82% wholesale market sales (USDA, NASS 2012). Fruits and vegetables are by far the largest category of organic foods, followed by dairy, beverages, packaged/prepared foods, breads and grains, and snack foods (Figure 1), (USDA, ERS 2014a).

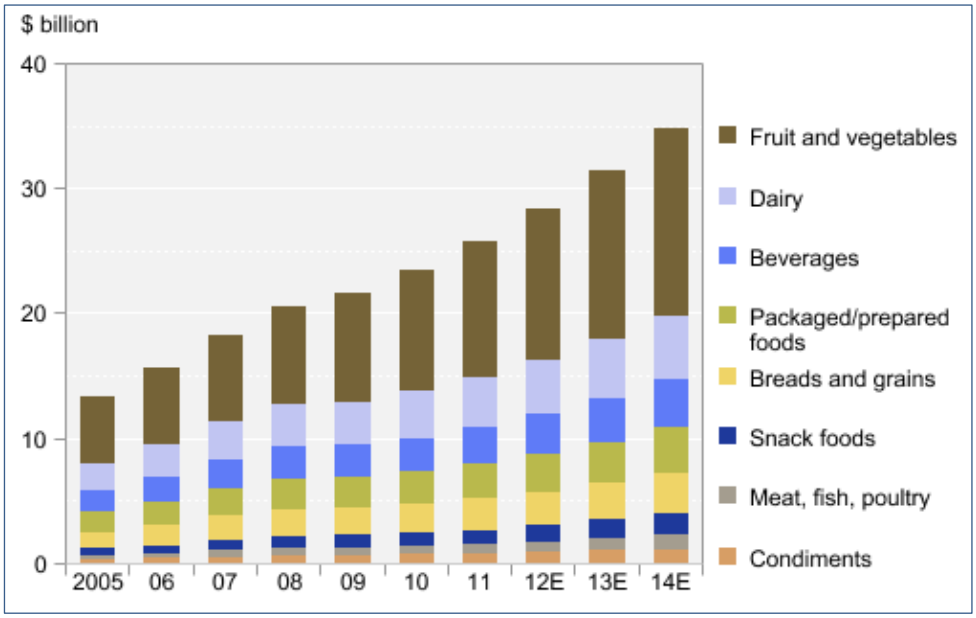

Figure 1. U.S. Organic Food Sales by Category, 2005 - 2014
Source. From Organic Agriculture: Organic Market Overview; USDA, ERS using data from Nutrition Business Journal (2014a). **Note.** E=Estimate

Organic food costs more to produce than conventionally produced food and generally sells at a premium at the wholesale and retail levels. In an analysis of 18 fruits and 19 vegetables conducted by the USDA's Economic Research Service (ERS) using 2005 data, the price premium was found to be less than 30% for two-thirds of the items. However, price premiums vary widely. For example, the price premium for blueberries exceeded 100% and private-label organic milk sold for 60% more than branded-conventionally produced milk (USDA, ERS 2009).

Federal and State Agricultural Marketing Orders

Agricultural marketing orders are industry-initiated programs that serve to assist producers in marketing their products by promoting quality products, standardized packaging, research, promotion and advertising, and market development. Marketing orders are designed to aid growers in promoting products and conducting activities, such as research or data collection, that would be impractical for individual growers to do on their own. The Agricultural Marketing Agreement Act of 1937 enables federal marketing orders and covers fruits, vegetables, and nuts, except for those products specifically excluded in the act. Federal marketing orders must be approved by a two-thirds majority of the voting producers, either by number or by volume. Once approved, growers are legally required to pay a mandatory assessment to support the activities of the marketing order. Federal marketing orders cover a variety of products, including many fruits and vegetables, such as avocados, carrots, pears, raisins, and tomatoes, and nuts, including almonds, hazelnuts, and walnuts.

The 2002 U.S. Farm Bill added a provision that allows growers who produce "solely" 100% organic commodities to petition for an exemption to the mandatory assessment for federal commodity-specific research and promotion orders (Klonsky 2007). This exemption was created to address concerns in the organic grower community that agricultural GMMPs do not adequately represent the interests of organic growers. The 2014 Farm Bill added a clarification that "all certified organic producers, including those that also have conventional farming operations, may be exempted from commodity promotion orders on their organic production" (USDA, ERS 2014b). The USDA indicated that "the option is established for the organic sector to develop an organic commodity promotion order" (USDA, ERS 2014b).

California, along with many other states, has authorized various GMMPs. These include marketing orders, agreements, councils, and commissions. California marketing orders and marketing agreements are governed by the California Marketing Act of 1937 and administered by the California Department of Food and Agriculture. California also provides for the establishment of councils and commissions through commodity-specific legislation. The major differences between marketing orders and commodity-specific councils and commissions pertain to the activities that are permitted. California has over 50 marketing boards, commissions, councils, and programs that promote California commodities. None of them provide an exemption from participating in the California State marketing programs for organic growers.

GMMPs have been utilized by producers of many commodities, at both the federal and state level, as a means of collective action to promote their products. In many cases they have endured

for years and enjoyed wide industry support. In other cases, such as with the federal order for California peaches and nectarines, growers have voted to terminate the order.

In the case of organic commodities, many growers have expressed dissatisfaction that the organic nature of their products has not been promoted by the various GMMPs. This has led to several attempts by organic producers to explore a structure that would provide growers with more control and flexibility in promoting their organic products. The organic exemption discussed above is one such example.

Another recent development was a provision in the 2014 Farm Bill that authorized the USDA to consider an application for a research and promotion order covering organic commodities. On May 12, 2015, the Organic Trade Association and the GRO Organic Committee submitted a petition to establish a separate multi-commodity Organic Research and Promotion Program that, if approved, could raise more than $30 million annually to promote and support the industry in the U.S. The petition includes an exemption for organic producers with gross revenue less than $250,000 (Organic Trade Association 2015a).

At the state level, there have also been several efforts to alter the structure of state GMMPs. For example, in 2002, a group of 20 organic apple growers expressed interest in opting out of the Washington Apple Commission and joining a commodity commission representing all organic foods grown in the state. The Washington State legislature considered the formation of an organic foods commission for the state of Washington (Washington State Department of Agriculture 2002). However, the idea was eventually dropped. There was a similar effort by organic growers in California to establish a state organic marketing order. However, it never gained enough support to move beyond an initial draft proposal (Amigo Bob Cantisano 2013).

Research Objectives

The broad objective of this research is to examine producer perspectives on California GMMP activities and assess their support for a marketing arrangement that would specifically promote organic produce. The specific objectives of this research are to:

- Assess the extent to which current California agricultural GMMPs specifically address organic produce;
- Document organic producer perspectives on California agricultural GMMPs and determine to what extent they believe that generic promotion through these mechanisms benefits the sale of organic produce; and
- Determine whether a California or federal organic marketing order or other arrangement that represents solely organic products would be supported by the California organic produce industry, and if so, what structure would be best suited to achieve industry goals.

Methods

We utilized several methods to address the three research objectives. Where possible, we employed multiple methods to ensure that we gained a broad range of perspectives and insights from a diverse group of stakeholders.

The first research objective of assessing the extent to which California GMMPs specifically target organic produce was primarily accomplished through a review of the GMMPs and published documents that addressed the programs' activities. We reviewed 16 California GMMPs. These included the California Apple Commission, California Artichoke Advisory Board, California Asparagus Commission, California Avocado Commission, California Cantaloupe Program, California Fresh Carrot Research and Promotion Program, California Cherry Marketing and Research Program, California Cling Peach Board, California Date Commission, California Fig Advisory Board, California Pear Marketing Program, California Dried Plum Board, California Raisin Marketing Board, California Strawberry Commission, California Table Grape Commission, and California Walnut Commission. The review of each GMMP included a comprehensive examination of the enabling legislation, reports, websites, and publicly available materials. Additional insights were gained through personal interviews and the focus group discussions, which are described in the following paragraphs.

The next step was to conduct personal interviews with certified organic farmers, processors and handlers, distributors, and marketers of organic products. The interviewees were selected to obtain a broad representation of commodities and perspectives on the organic industry and GMMPs. An interview guide was employed to provide consistency in the questions that were asked. The personal interviews were instrumental in understanding the issues and range of perspectives shared by key players regarding GMMPs in the organic produce industry in California. The issues addressed in the personal interviews included:

- Production of organic and conventionally-produced crops;
- Marketing and pricing of organic and conventionally-produced crops;
- GMMP assessments and services;
- Evaluation of marketing and promotion activities provided by the GMMP;
- The level of grower support for adding marketing and promotion services for certified organic products to the GMMP; and
- The level of support for the formation of a multi-commodity marketing order that would specifically promote certified organic crops.

Three focus group meetings were organized in three regions of the state. Each region represented a distinct production area that had a substantial concentration of organic producers. The meetings were held in Escondido (near San Diego), Fresno (Central Valley), and Watsonville (near Salinas). The questions addressed in the focus groups were similar to the interview questions discussed above. However, the interactive nature of the focus group meetings encouraged the discussion of issues based on the perspectives and ideas presented by focus group members. In addition to the six issues covered in the interview guide, focus group members were asked which of several marketing structures they thought could be used to most effectively promote organic crops.

The Escondido focus group had 16 participants and included avocado, citrus, and strawberry growers. The farm size ranged from 2 to 600 acres. Two of the growers' commodities were represented by state GMMPs, including the California Avocado Commission and California Strawberry Commission. One of the avocado growers was a board member of the California Avocado Commission.

In Fresno, the focus group had six participants, including stone fruit and grape growers. Farms ranged in size from 65 to 500 acres. The state GMMPs that promoted the growers' commodities included the California Cling Peach Board, California Raisin Marketing Board, and California Table Grape Commission. The lone cling peach grower was a member of the California Cling Peach Board.

In Watsonville, seven growers participated in the focus group, representing strawberry, cane berry, blueberry, table grape, apple, and specialty lettuce and microgreens crops. Farm size ranged between 2 and 90 acres. The state GMMPs that covered these crops included the California Apple Commission, California Strawberry Commission, and California Table Grape Commission.

Input gathered from the personal interviews and focus groups, as well as discussions with industry experts, was used to refine the issues and develop a survey that was administered to certified organic growers in California. The survey contained questions on growers' operations (acreage, sales, organic certification, distribution channels, prices received, and marketing and promotion expenses), the organic market (consumer perceptions, market data, and pricing), and California GMMPs (crops covered, knowledge and opinion of the GMMPs and their effectiveness, and opinions on potential changes).

The survey was administered online in late April and early May 2013. A list of certified organic producers was obtained from the USDA National Organic Program based on data provided from all third-party organic certification agencies in the U.S. The list was filtered to include only California growers producing the 16 fruit, vegetable, and nut crops that were the subject of this research. The initial list contained 1,508 growers; however, 56 email addresses were removed from the list either because the grower asked to be removed or because the email address was no longer valid. A total of 286 surveys were completed out of the 1,452 survey invitations for a response rate of 19.7%. After removing the 19 growers who were no longer certified as an organic producer and another 20 growers who provided limited responses, we had 247 respondents, although some respondents did not respond to every question.

Crops produced by the survey respondents represented a wide variety of crops, including all of the crops that were the subject of the GMMP review and many more. Most of the farms represented in the survey were relatively small. Over one-half of the farms (63%) were less than 50 acres while only 21 farms were 500 acres or more (Figure 2). This is fairly consistent with data for all California organic growers that indicate that 58% of organic farms are less than 50 acres (US Census Bureau 2012).

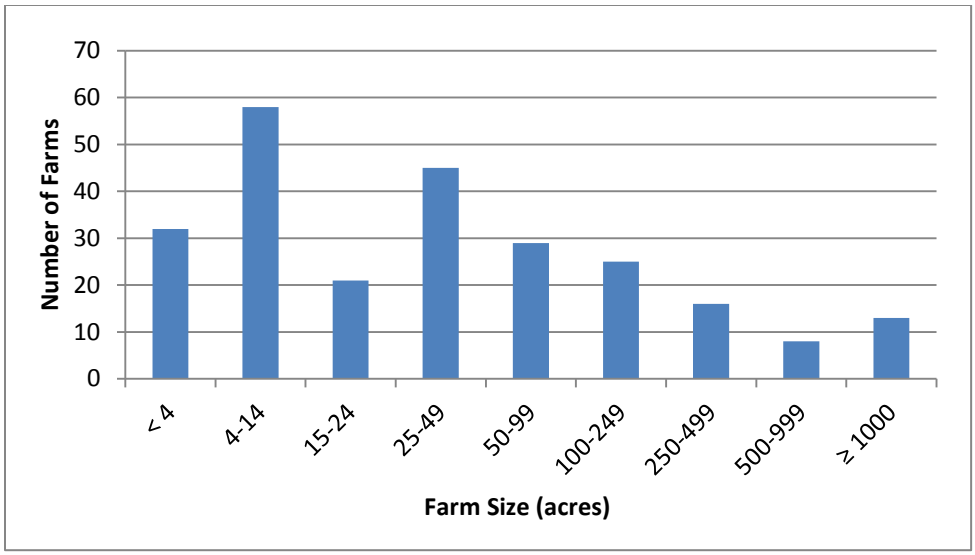

Figure 2. Certified Organic Acres Farmed by Survey Respondents

Farm revenue followed a similar pattern with most farms (56%) reporting gross revenue from organic sales of $100,000 per year or less. However, 42 farms (23%) reported organic sales of more than $500,000 (Figure 3).

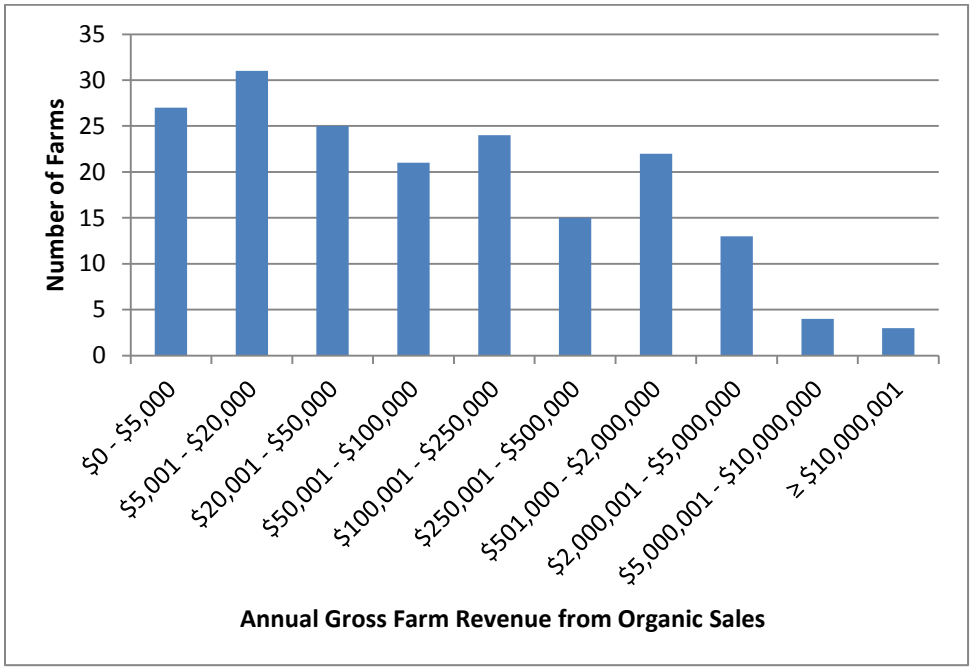

Figure 3. Annual Organic Sales of Survey Respondents

Our sample appears to have a somewhat higher representation of larger organic farms compared to data reported for California in the 2012 US Census. Approximately 55% of the farmers responding to our survey indicated that they had organic sales of $50,000 or more as compared to 44% of farmers in the 2012 census (US Census Bureau 2012).

Organic growers sold their certified organic crop through many different channels. The predominant distribution channel was wholesale (75%), followed by retail (33%), farmer's markets (31%), restaurants (25%), farm stands (17%), CSAs (16%), and other (14%). The other category included a variety of channels, including mail order, Internet, and industrial sales. Growers often sold their crop through two or more channels. Many of these channels do not require substantial marketing support, especially wholesale, farmer's markets, and restaurants, which may explain why growers' marketing expenditures are relatively low.

Results

Focus of GMMPs on Organic Agriculture

One of the principal research questions was to determine whether and to what extent California GMMPs specifically target organic crops. We began by reviewing the enabling legislation for each of the 16 GMMPs listed in the previous section. We found no wording in the legislation that specifically mentioned organic activities. We then reviewed the websites, reports and other public information for each of the GMMPs. We found that many of the programs addressed organic products. However, in most cases, the activity of the commission or board was limited to providing information. Some examples of the type of information collected and/or provided include data on organic acreage, production, prices, organic growers and handlers of the commodity, organic production methods and growing costs, and seminars on organic production. In some cases, the commission or board sponsored research that specifically targeted or otherwise benefitted organic growers. For example, the California Apple Commission sponsored research on pesticides that could be used by organic growers (California Apple Commission n.d.). Furthermore, research on Integrated Pest Management and biological controls benefits both organic and conventional growers. We found no instances where organic crops were specifically promoted by the commissions or boards.

The question of whether the GMMPs focused specifically on organic crops was also addressed in the personal interviews and focus group meetings. These groups represented a broad range of industry representatives including growers, processors, and distributors of organic products. Some participants in the discussions were very knowledgeable about some of the GMMPs as they were elected representatives (board members) of a program. The discussions focused on promotional aspects of the boards and commissions. The people whom we interviewed and the participants in the focus group meetings indicated that they were not familiar with any promotional activities of GMMPs that specifically focused on organic crops.

Organic Growers' Perspectives on GMMPs

The second objective of this research was to explore whether growers of organic products subject to California State GMMPs believe that these programs benefit their organic crops. (Note that in several questions we used the term "marketing order" or "marketing order/commission" as short hand for GMMP.) As with the previous question, we approached this issue from several perspectives, utilizing information gained in the personal interviews, focus group meetings, and specific questions from the survey.

We began by trying to understand organic growers' perspectives on marketing organic produce, including grower marketing efforts, consumer knowledge, and organic pricing. We found that most organic growers spend very little in marketing and promoting their organic crops (Figure 4). Approximately two-thirds (65%) of growers surveyed spend less than $1,000 marketing their organic crop while 10% spend more than $10,000. While this is not entirely unexpected due to the relatively small size of most organic growers, it does indicate that relatively little is invested in promoting organic commodities at the grower level.

Figure 4. Annual Marketing and Promotion Expenditures on Certified Organic Crops of Survey Respondents

Several questions were directed at understanding organic producers' perspectives of the organic marketplace. The responses to questions regarding consumer perspectives, data availability, and pricing are discussed in the following paragraphs and reported in Table 1.

Two questions addressed the prices growers received for their certified organic products. While a majority of growers (59%) believed that they consistently received a premium price for their organic crops, a large minority (41%) either believed that they did not consistently receive such a premium or were unsure. Price premiums are critical to the success of the organic farmer because organic production costs are typically higher due to lower yields per acre or increased labor costs (generally for weed management). This result indicates that price premiums are not guaranteed. Moreover, this may be a motivating factor behind growers' desire for promotional activities that tout the benefits of organic products.

Regarding the question of price variability of organic versus conventionally-produced products, the opinions of organic producers were mixed. Thirty-six percent of growers felt organic prices

were more variable while 25% thought they were not. Although only about a third of growers thought price variability was greater for organic as compared to conventionally-produced products, this highlights a potential area of focus for marketing activities focused on organic products.

Table 1. Organic Growers' Perspectives on the Organic Market

	Level of Agreement				
Statement	**Strongly Agree**	**Agree**	**Neither Agree nor Disagree**	**Disagree**	**Strongly Disagree**
I consistently receive a premium price for my certified organic crop.	15.4	43.9	17.2	15.8	7.7
I believe organic prices are more variable than conventional prices.	6.3	29.4	39.4	20.4	4.5
I have access to sufficient data about the organic market to promote my certified organic crop.	11.8	33.9	32.1	19.5	2.7
Consumers understand the difference between certified organic and other eco-labels.	5.0	23.2	22.3	39.5	10.0
Organic consumers are a niche market and organic will never be mainstream.	4.1	24.9	24.4	37.1	9.5

Note. N = 221 for all statements except for the first statement where n = 220.

We also sought to understand organic growers' perspectives regarding access to information to help market their crops. Producers of major commodities, such as corn, soybeans, and wheat have access to a large amount of information provided by the USDA that growers of minor crops do not. GMMPs often collect data regarding volumes and pricing for smaller volume crops, including fruits, nuts, and vegetables. We asked growers whether they have access to sufficient data about the organic market to promote their certified organic crop. Almost half of respondents (46%) indicated that they do have sufficient data while 22% indicated that they do not. It appears that organic growers feel that they are fairly well served regarding data on their organic crops.

Regarding organic growers' perspectives on consumers, we asked whether growers believed that organic consumers were a niche market that would never become mainstream. Close to half of respondents disagreed with this statement, while only 29% agreed, an indication that many organic growers see a large growth potential in the organic market. We also asked whether growers believed that consumers understand the difference between certified organic and other eco-labels. Only 28% of growers thought that consumers understood the differences between the various labels. This underscores potential issues for organic growers associated with the proliferation of labels such as natural, sustainable, GMO-free, and other eco-labels. Moreover, this is consistent with consumer research that indicates that one-third of consumers do not understand the meaning of the organic labels (Organic Trade Association 2013). This suggests an opportunity to better differentiate certified organic products, one that might benefit from some type of collective action, such as a GMMP focused on organic produce.

To assess the perceived value of state GMMPs to organic growers we asked two questions regarding the impact of GMMPs. The first question focused on sales while the second question addressed value received relative to the assessment. In both cases we report the results based on the value of the grower's organic sales. Growers with less than $50,000 in organic sales were considered small; growers with $50,000 or more in organic sales were considered large.

The first question asked for the level of agreement with the statement, "I believe the generic marketing and promotion programs of the marketing order/commission increase the sales of my certified organic crop." Overall, respondents were fairly evenly split between those who agree with the statement, those who disagree, and those who had no opinion one way or the other. There was a difference in how large and small growers perceived this issue. A much higher percentage of the larger growers (22%) strongly agreed that generic marketing and promotion programs increased the sales of their organic crop than did smaller growers (5%), (Figure 5). This may be because large growers utilize a different mix of channels in marketing their products. Whereas small growers rely more heavily on direct sales channels, such as farmer's markets and restaurants, large growers were especially dependent on the wholesale channel and may benefit more from generic marketing activity.

This question gets at the heart of a key issue for organic growers, that is whether generic promotion benefits sales of their products. A key argument for the inclusion of all growers in a GMMP, regardless of the product, is that promotion of the commodity product benefits all producers. This is sometimes expressed as "a rising tide floats all boats." In the focus group discussions an avocado grower commented that, "An increased market for avocados means an increased market for organic avocados." Our survey results indicate that about one-third of growers, and larger growers in particular, believe that generic promotion through GMMPs does benefit organic sales.

On the other hand, there seems to be a fairly large segment of growers that questions whether GMMPs benefit organic products. This is especially true for small growers. When we add those who disagree with the statement that GMMP benefits organic sales to those who are unsure, we find that well over half of those surveyed, both small and large growers were either negative or neutral on this issue. The focus groups revealed substantial dissatisfaction with GMMPs that generally fell into two categories. One group felt that the assessments were a waste of money and that growers would be better off keeping the money themselves. One grower commented that it is "money not well spent," and another grower stated that "A lot of people don't think we're getting our money out of it." Members of the second focus group expressed dissatisfaction that the GMMP did not set aside a portion of the assessment for organic promotion. Yet another argument is that the GMMP actually undermines the interests of organic growers. A strawberry grower argued that the California Strawberry Commission actively worked against organic interests by working to maintain the critical-use exemption for methyl bromide.

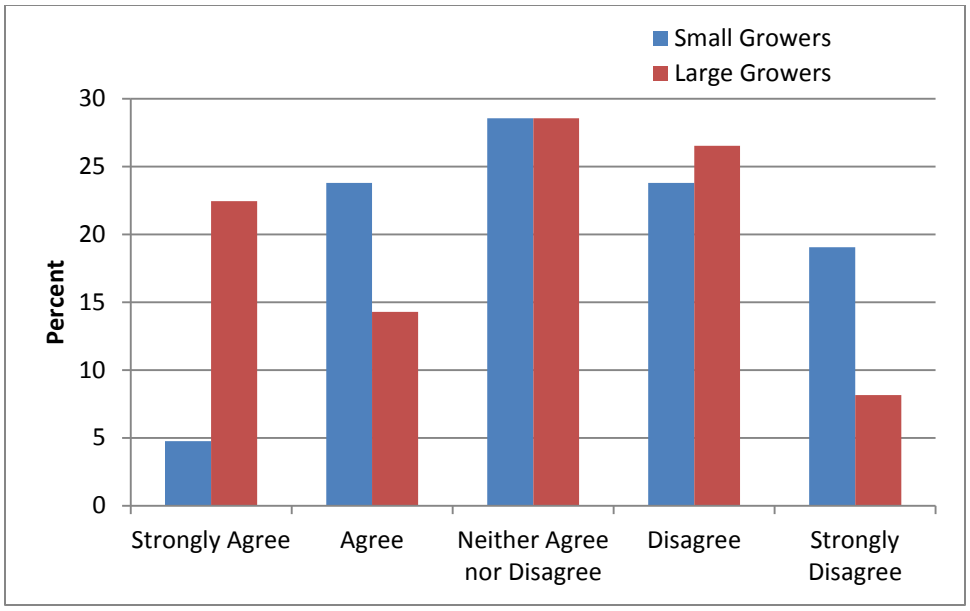

Figure 5. Level of Agreement among Organic Growers that Membership in a GMMP Increases Sales of their Organic Crop
Note. Small growers had organic sales of less than $50,000; large growers had organic sales of $50,000 or more.

The most direct assessment of organic growers' opinion of the value of GMMPs was their response to the statement, "I believe that I receive good value relative to the size of the marketing order/commission program assessment I pay," (Figure 6). Overall, the response pattern was similar to that of the previous question on the value of generic marketing, with the responses fairly evenly distributed between those agreeing with the statement, those disagreeing, and those having no opinion. Likewise, a much higher percentage of the large growers (20%) strongly agreed that they received good value for the assessment they paid than did the smaller growers (5%). Despite the agreement that there is good value in the GMMP assessments by many growers, we find that most growers, both large and small, are either neutral or disagree that they receive good value for what they pay.

The responses to this question along with those to the previous question indicate that there is substantial doubt, if not dissatisfaction, with the GMMPs when viewed from the perspective of organic growers. We might compare these numbers to the two-thirds majority that is required for passage of California State GMMPs. The two-thirds majority is a relatively high standard that indicates broad industry support for the program at the time of passage. Our results indicate that such broad industry support for the commodity GMMPs does not appear to be held by organic growers.

We found a small number of growers who were unfamiliar with GMMPs. Responses to questions regarding their knowledge of marketing orders included, "I am not aware of this term," "Don't know anything about it," "I am not familiar with them – what are they?" and "What are marketing orders?" Although these growers were a small minority, there were a few growers who indicated their lack of awareness of GMMPs in the personal interviews, focus groups, and survey responses. At each of the three focus group meetings, at least one producer asked for an

explanation of GMMPs at the beginning of the meeting. These growers tended to be relatively small producers.

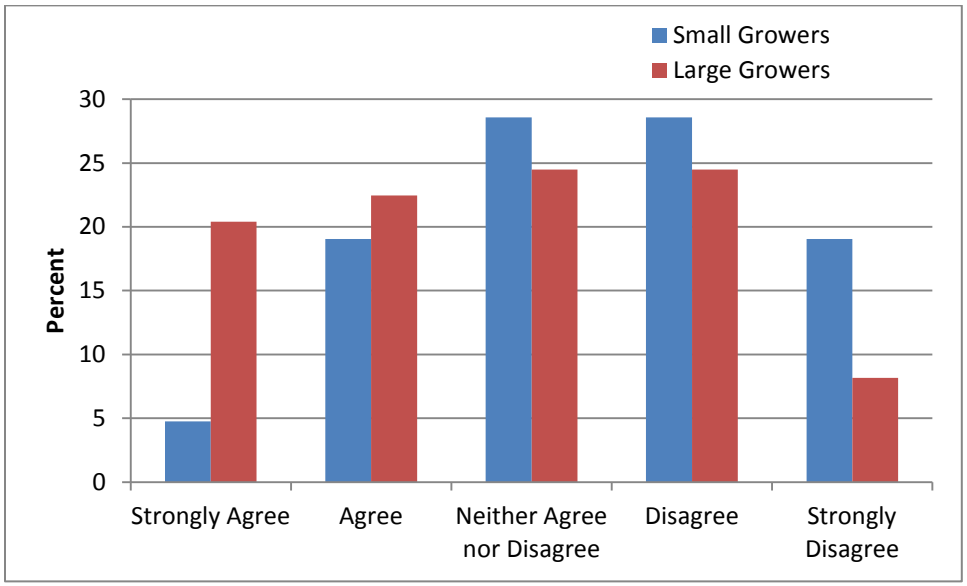

Figure 6. Level of Agreement among Organic Growers that They Receive Good Value for the GMMP Assessment

Organic Growers' Perspectives on GMMP Alternatives

Our final research objective was to explore alternatives to the traditional GMMP structure where all producers of a commodity pay a mandatory assessment and vote for the board leadership of the program. One such alternative, described earlier in this paper, has been proposed by the Organic Trade Association and GRO Organic Core Committee. The proposal would establish a federal organic marketing program called the Organic Research and Promotion Program.

We asked organic growers to rank several marketing and promotion options (Table 2):

- The status quo: maintain marketing and promotion program of current marketing order as is;
- Modify existing marketing order to allocate a representative portion of the assessment to organic promotion;
- Establish a non-governmental producer association to specifically market/promote organic produce;
- Establish a state multi-commodity organic marketing order to specifically market/promote organic produce;
- Establish a federal multi-commodity organic marketing order to specifically market/promote organic produce; and
- Market/promote organic produce myself.

Table 2. Organic Growers Preferences for Marketing and Promotion Alternatives

	Rank						
Alternative	**1**	**2**	**3**	**4**	**5**	**6**	**Avg. Rank**
Status quo	11.1/8.9	22.2/15.6	16.7/20.0	11.1/11.1	16.7/6.7	22.2/37.8	3.7/4.0
Modify existing order	44.4/37.8	16.7/20.0	16.7/13.3	16.7/6.7	0.0/15.6	5.6/6.7	2.3/2.6
Producer association	16.7/8.9	22.2/28.9	27.8/28.9	22.2/24.4	11.1/6.7	0.0/2.2	2.9/3.0
State organic order	0.0/0.0	16.7/15.6	5.6/15.6	38.9/35.6	38.9/28.9	0.0/4.4	4.0/3.9
Federal organic order	0.0/6.7	5.6/8.9	22.2/13.3	5.6/13.3	22.2/22.2	44.4/35.6	4.8/4.4
No collective marketing	27.8/37.8	16.7/11.1	11.1/8.9	5.6/8.9	11.1/20.0	27.8/13.3	3.4/3.0

Note. The Rank columns show the percent of respondents who selected each alternative as their 1st, 2nd, 3rd, etc. alternative, with 1 being the most preferred alternative and 6 being the least preferred. Small growers (with organic sales of less than $50,000) are listed first, followed by large growers (organic sales of $50,000 or more).

The rankings were similar for both the small and large growers as seen in the average ranking. We conducted the Mann-Whitney U test and found no statistically significant difference between how the two groups ranked the proposals.

Growers generally fell into one of three groups, those who are generally happy with the current state of affairs, those who would like to see some sort of producer association that focused on marketing organic produce, and those opposed to collective marketing. Almost four in ten producers (38%) thought that modifying the existing GMMP so that a representative portion of the assessment was dedicated to marketing the organic product was the best option. Roughly three-fourths of respondents ranked this alternative as their first, second, or third choice and it was the preferred choice of both small and large growers. We believe this indicates that organic growers see value in the current structure of GMMPs, but that they would like a portion of the mandatory assessment allocated to the marketing of the organic product.

The idea of a non-governmental producer association that would promote organic produce was also highly ranked by organic growers. While it received relatively few votes as the most preferred alternative, roughly two in three producers ranked it as their first, second, or third choice. It was the second-highest ranked alternative, behind modifying the existing structure to specifically promote organic products for both small and large producers. This indicates that there is substantial support for a producer association whose primary goal would be the promotion of organic crops. Since no details were provided regarding the possible structure or assessments of the proposed association, we cannot speculate on how much support an actual proposal might garner. The level of support would likely be determined by the specific details and the proposal would undoubtedly be controversial, especially if it involved exempting organic growers from paying an assessment to either federal or state GMMPs.

The option to not participate in a GMMP (market/promote myself) was highly ranked by organic growers with over one in three producers (35%) choosing it as the preferred alternative and over half selecting it as their first, second, or third choice. Our research uncovered much dissatisfaction among growers who are unhappy with the existing GMMP system, although their

reasons varied. Some growers felt that GMMPs are not needed because they did their own marketing. This was the case for many smaller growers who sold directly to consumers and indicated that they had no need for organic promotion. Other growers believed that the marketing boards and commissions were a waste of their money. A common sentiment among many organic growers was that they believe they are paying twice, once to the GMMP for generic marketing, and again as they fund their own marketing efforts. One grower commented that the marketing commission has a big, fancy office, a lot of employees, and that this means high costs for the marketing program. Still other growers did not believe that the GMMPs represented their interests as organic growers, that is, that the commission did not promote organic products, promote their specific variety, or conduct other beneficial activities. A common theme among this group was that they would rather "keep their money."

The remaining three alternatives did not receive much support among those responding to the survey. Both the federal and state multi-commodity GMMP alternatives had over two-thirds of respondents ranking these proposals as their fourth, fifth, and sixth choices. The status quo had approximately one-third of those responding listing it as their least preferred choice.

Summary and Conclusions

The first part of this paper explored California GMMPs and how they address organic crops. We examined GMMP materials covering 16 fruit, vegetable, and nut crops and spoke to numerous growers in personal interviews and focus groups. We found that some of the GMMPs provided data, such as acres planted, production, and prices as well as information on available research and seminars that are specific to organic production. We also found that some GMMPs conducted research programs that either specifically benefitted organic growers or was valuable to organic growers. We did not find evidence that any of the GMMPs we researched allocated funds to specifically promote organically produced commodities.

We also examined organic growers' marketing efforts and their perspectives on activities that might influence their opinions of GMMPs. We found that most organic growers spend relatively little on marketing their certified organic crops, less than $1,000 per year. Selling through wholesale channels (75% of producers) was the most common market channel, followed by retail (33%), farmer's markets (31%), and restaurants (25%). Most growers indicated that they consistently receive a price premium for their organic crops although a substantial minority (41%) indicated that they either do not consistently receive a higher price for their organic crops or that they are unsure as to whether they do.

The biggest challenge identified by organic growers was in regards to consumers' understanding of the organic label. While most growers believed that the organic segment of the market was strong and permanent, there was considerable concern that consumers do not understand the difference between the certified organic label and other eco-labels.

The key objective of this research was to evaluate how GMMPs serve the organic produce industry and whether an alternative structure might be better received by growers. It is clear that the industry supports a structure that would specifically promote organic products. When asked to rank several alternative marketing schemes, the top two choices, favored by both small and

large growers, both focused on a collective marketing structure that would promote organic products.

There was also a group of growers who preferred no collective marketing for their organic crop, with this alternative ranking third of the six options. While we did not explore the reasons behind the choices, we speculate that this may be due to several factors, including dissatisfaction with current marketing boards and commissions that do not specifically target organic products and the belief among many growers that they do not receive good value for the GMMP assessments they pay. Responses to our survey and in focus group discussions indicate that there is substantial dissatisfaction with existing GMMPs by organic producers because the boards and commissions do not specifically promote the organic commodities. Many growers, particularly smaller producers, market their products through on-farm sales, farmers markets, and restaurants, and may feel that their sales are relationship-driven and therefore do not benefit from collective promotion and marketing.

Recently, the Organic Trade Association and the GRO Organic Core Committee petitioned the USDA to establish a research and promotion check-off program for organic products entitled Generic Research and Promotion Order for Organic or GRO Organic (Organic Trade Association 2015a). The USDA has solicited additional proposals for research and promotion marketing orders for organic products in order to get greater industry input. Although other proposals may surface, the following discussion is limited to examining the implications of this research for the application submitted to the USDA. It is important to note that the specifics of this proposal were not released until after our data collection was complete and therefore the details of this proposal were known to neither the authors of this research nor to those growers we contacted. Thus the proposal was not included as one of the options that were ranked in the survey of various market order structures.

Some key details of the proposal are (Organic Trade Association 2015b):

- A referendum requiring that a majority of eligible voters (growers, importers, or small growers who opt-in) approve the proposal;
- A board made up of 50% producers and 50% handlers would be elected;
- The assessment rate would be one-tenth of one percent of net organic sales;
- Growers with $250,000 or less in gross organic sales can choose whether to pay the assessment; and
- The allocation of funds would be 25% for research, 25% for information, 25% for promotion, and 25% for discretionary expenses.

Although this study did not directly examine California growers' reactions to this proposal, our results and analysis shed light on how this proposal might be received. Perhaps most importantly, the proposed program would specifically fund research, information, and promotion on organic products. Much of the dissatisfaction with California State GMMPs revolved around the lack of focus on organic marketing and promotion and, more generally, issues important to organic growers. The proposed program directly addresses this concern. Moreover, an organization focused solely on organic products could address emerging issues, such as consumer confusion over natural foods and eco-labels, that many organic producers feel threaten their industry.

The GRO Organic proposal appears to be well thought out in that it targets the needs of the organic community without being unduly burdensome. The assessment rate is low by comparison to many GMMPs at one-tenth of one percent. Yet, because it is broad-based and covers many organic commodities, it is expected to generate sufficient funds ($35 million) to have a positive impact on the industry (Organic Trade Association 2015b).

Our research found that compared to smaller growers, larger producers tended to be more likely to believe that GMMPs increased the sales of their organic products and that GMMP assessments were a good value. The decision to include only larger producers in the referendum voting and thereby exclude those producers who are least likely to see the value in GMMPs will enhance the chances of a positive result from the referendum.

We foresee few potential pitfalls to the current proposal. However, one potential issue is that the proposed program would include a great many commodities. While the anticipated $35 million is a sizeable budget, there will be many competing demands for the funds and many growers of different organic commodities vying for those funds. This may be especially apparent when it comes to research. Much research is commodity-specific and very costly which may make choosing between competing projects and therefore satisfying the members difficult. Additionally, while the common interest in promoting organic production and sales will bind the growers together, the possibility of divergent interests could prove divisive and make meeting grower expectations difficult.

Our study has several limitations. While we invited a large number of growers to participate in the focus groups and to complete the surveys, those who chose to do so were self-selected. The characteristics of those completing the survey were fairly similar to those of all California organic farmers along two dimensions, farm size (acres farmed) and value of organic sales. Nonetheless, there is the possibility that the results are biased in ways we do not know. Moreover, a larger sample would have allowed us to delve deeper into the relationships between growers' opinions and characteristics such as market channels, crops produced, assessments paid, and other factors.

In summary, we find that organic growers are split regarding their opinions of whether or not generic GMMPs benefit their organic crop. One group apparently believes that promotion of the generic crop benefits both the conventionally and organically grown commodity. Another group is of the opinion that growers do not receive good value for the assessment that they pay because the generic promotion activities do not specifically address organic concerns. Furthermore, many growers felt that there are some major challenges facing organic growers, including consumer confusion and competing labels (such as natural) that will not be addressed by existing GMMPs.

There was strong support for changes in the existing GMMP structure that would ensure that organic issues are addressed. Although the GRO Organic proposal was not yet released at the time this study was conducted, it appears to address grower concerns and be designed to target those large growers who stand to benefit the most while exempting those small growers who make up a large percentage of growers and who are likely to be most skeptical of the benefits.

This study provides baseline information on California organic producers, their organic production, market channels, and opinions on existing state GMMPs. Additional research and a larger data set is needed to look at characteristics of specific GMMPs and how they are perceived by members. Moreover, as efforts to develop a national organic marketing order develop, additional research will be useful in assessing the proposal as well as the effectiveness of any new GMMP.

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Consumer Interest in Meat Labelled Attributes: Who Cares?

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Abstract

The aim of the study is to better understand consumer attitudes about meat origin, cattle breeding and feeding systems. We analysed the determinants that lead consumers to use labelled information contained on fresh beef and processed beef products. Information was gathered by telephone using a questionnaire survey conducted in the northern Italy. The survey sampled nearly 1000 consumers. Four binary logit models were used to investigate consumers' use of specific labelled information using a set of variables to identify the primary determinants. Results showed that the use of different types of labelled meat-information is affected by the variables related to socio-demographics, product quality, safety perception, and consumer food knowledge.

Keywords: labelled information, meat, consumer economic analysis, logit analysis, Italy

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Introduction

Overall, meat consumption per capita has increased globally (FAO 2014). Economic and population growth in developing countries have greatly contributed to this positive trend. Rising incomes have helped alleviate protein deficiencies while providing nutritional and dietary upgrades (Fayaz Bhat and Fayaz 2011). In contrast, consumers in developed countries are not expected to contribute positively to increases in animal protein consumption in the future. A slight decline suggests saturation has occurred and meat consumption has peaked in many markets (Pethick et al. 2010). Specifically, changes in meat prices, growth of aging populations, and health and dietary awareness may explain a substitution dynamic occurring in developed markets between red and white meat consumption (Henchion et al. 2014; Aepli and Finger, 2013). In the last half century, chicken prices have decreased due to technology advances and changing consumer preferences for lighter diets leading to increases in white meat intake, while red meat consumption is observing a negative per capita trend (Kayser et al. 2013).

Within this context, the quality of red meat is becoming more important than price in determining food choices (Verbeke et al. 2010; Banterle et al. 2011). The meat industry faces challenges to fully understand how consumers form their quality opinions about red meat and which attributes positively affect consumer preferences so that they may develop effective differentiation strategies (Bansback 2014). Current literature shows that consumers are also interested in intrinsic quality meat attributes such as animal welfare, production systems, and animal origin (Realini et al. 2013,Vanhonacker et al. 2013, Schnettler et al. 2009).

Within the European normative framework on meat labelling, more attention is being paid to meat quality attributes. Regulation 1760/2000 introduced the possibility to adopt voluntary labelled information concerning specific attributes of beef products such the type of cattle breeding, animal feeding, etc., providing traceability systems aimed at guaranteeing the supply chain transparency and the truthfulness of labelled information. New Regulation 653/2014 has amended the previous regulation in order to simplify the management of the voluntary labelled information by reducing the costs of adoption and control of voluntary traceability system. Moreover, the new rules stipulate that the voluntary labelled information must be in line with Regulation 1169/2011 regarding the horizontal legislation on labelling. Information must be objective, verifiable by the relevant authorities, and understood by consumers. In Italy, the national legislation (January the 16th, 2015) has implemented the new European Regulation specifying, in accordance with previous rules, that the voluntary information can refer to the animal characteristics (breed or genetic type, information about animal welfare, etc.), farming (breeding system, the food ration, therapeutic treatments, cattle feeding) and slaughtering.

This new legislation focuses on consumers' changing needs for information and their interest in information disclosure in order to make appropriate food choices. However, a large body of literature has stressed the difference between the importance consumers place on the information contained on meat labels and the use of such information. Many food labels receive only limited attention (Drichoutis et al. 2005, Rawson et al. 2008) and consideration when consumers make food choices (Grunert and Wills 2007, Möser et al. 2010). Current research also finds that consumers face some barriers when using labelled information (Bialkova et al. 2013, Graham et al. 2012, Grunert et al. 2010).

This study aims to understand the factors that lead consumers to seek certain types of labelled information about fresh beef and fresh processed beef products.

The analysis used a telephone questionnaire containing a multiple-choice format with a dichotomous (1 to 5 rating) scale. The sample was composed by nearly 1,000 consumers living in Northern Italy. Four binary logit models where used to estimate and investigate how consumers use specific information contained on labelled fresh meat using a set of variables to identify the main determinants. These include: socio-demographic characteristics, food quality attributes, consumer healthy life attitude, consumer nutritional knowledge and source of information most used, and consumer food safety attitudes.

The paper is organized as follows: (1) the next section provides an overview of economic literature analysing meat consumers' interest in labelled information; (2) followed by the empirical model, survey, sample and variables. (3) Results and findings are then presented; (4) leading to concluding remarks and managerial implications in the final section.

Background: Meat Labelling and Consumer Attitude

Market inefficiencies linked to credence attributes in food products have led regulatory authorities to use product labelling as an important means towards improving consumer communication regarding information contained in food products (Caswell and Modjuska 1996, Banterle et al. 2013, Fernqvist and Ekelund 2014). Likewise in the meat sector, different credence attributes are search cues contained on package labelling that allow consumers to know more about the intrinsic characteristics of meat products.

Among the European normative framework on labelling, the intrinsic quality attributes in meat production include the origin of meat, the systems of cattle breeding, and the systems of cattle feeding.

In Europe, the labelling of beef origin is mandatory and refers mainly to Regulation 1760/2000, Regulation 1169/2011, and Regulation 653/2014. Most of the studies have demonstrated clear interest from consumers in obtaining such information (Realini et al. 2013, Imami et al. 2011, Schnettler et al. 2009, Loureiro and Umberger 2007, Verbeke and Ward 2006, Bernués et al. 2003, Roosen et al. 2003).

Labelled information on systems of cattle breeding and feeding have been recently regulated at a European level (Regulation 653/2014), national level, and through private standards. In Italy examples of private standards include terms such as: *pasture-raised*, *organic production* and *livestock sustainable production*. Napolitano et al. (2007) found that animal welfare information about breeding conditions has had a positive effect on meat acceptability. Other authors note consumer interest in organic production and the role related labelled information has in increasing consumers' preference (Napolitano et al. 2010, Janssen and Hamm 2012, Fernqvist and Ekelund 2014).

Information on cattle feeding refers mainly to traceability labels in Italy. Such voluntary information approved by European regulation refers to the absence of animal fat, genetically

modified organisms (GMOs), or antibiotics in animal feeding. The literature stresses consumers' interest in the quality attributes reported above. Maiorano et al. (2010) analyzed labelled information related to feeding systems and consumers' expectations and acceptability of meat. Realini et al. (2013) examined labelled information about the finishing diet (grass, grass plus concentrate, concentrate) of cattle and the impact on consumers' beef choices. Other authors have surveyed consumers' preferences on different GM labelling policies and the presence or absence of GM ingredients in cattle feed (Crespi and Marette 2003, Loureiro and Hine 2004, Lusk et al. 2004, Hu et al. 2005).

Although meat labelling captures consumer interest, a large body of literature has stressed a discrepancy between the importance given to the information on labels and the effective use of such information (Dranove et al. 2003, Verbeke 2005). Many labels on foods often receive only limited attention and consideration when consumers make food choices (Grunert and Wills 2007, Möser et al. 2010).

Current research shows that consumers face some barriers when navigating through labelled information, which can be linked both to their bounded rationality and other external factors. Bounded rationality refers to the cognitive limitations of the mind, the time available to make the decision, and the quantity of information available regarding the food choice. More precisely, many authors stressed a positive relationship between the level of consumer food knowledge and label usage (Grunert and Wills 2007, Grunert et al. 2010). Time constraint influences the use of food labels negatively (Rawson et al. 2008). Moreover, many authors found too much information runs a risk of information overload, leading to confusion or a lack of interest (Salaün and Flores 2001, Verbeke 2005). This problem can be connected to the 'rationally ignorant consumer hypothesis' in which consumers do not consider all the information available on food products, even though such information is free. This is because the opportunity costs of acquiring all the provided information would be too high (McCluskey and Swinnen 2004).

Recent literature has also examined the role of some external factors, like label characteristics (label size, color, format etc.) on consumer label use (Graham et al. 2012). Labels often differ in terms of 'visual clutter', i.e. size (the dimensions of labels and the amount of information contained on them), proximity (the spatial distribution of labelled information), and congruency (color, shape, semantic category) (Bialkova et al. 2013, Hodgkins et al.2012, Mata et al. 2011, Henderson et al. 2011).

Meat label information in Italy related to cattle breeding systems is characterized by size and congruency. Big labels and bright colors are commonly used to inform consumers about organic or sustainable production. While information concerning animal origin and feeding conditions are available on meat traceability labels, which provides a considerable amount of detailed information in small print with no label coloring.

The aim of the study is to better understand consumers' attitudes towards meat origin, systems of cattle breeding, and feeding. Specifically, we analysed the determinants that lead consumers to use the different kinds of labelled information on meat products. With regard to the literature we can summarize variable categories affecting consumer use of food labelled information as follows: socio-demographic and individual characteristics, attitude towards food quality, healthy

life style choices, food knowledge and source of information, and food safety attitudes (Drichoutis et al. 2005, Stranieri et al. 2010).

The first category includes variables such as gender, education, age, income, and body mass index. Regarding gender and education, different studies pointed out that women with higher education levels are more likely to use labelled information (Nayga 1996, Behrens et al. 2007). Aging consumers seem to be less prone using food label information. Younger people are more likely to read food labels; even though older respondents perceive risk reducing strategies (including label use) to be more useful than younger consumers (Todd and Variyam 2008, Bayarri et al. 2010).

Regarding quality attributes, the literature highlights some extrinsic and intrinsic cues affecting label usage, including: price, ingredients, certifications, product freshness, and expiry date (Botonaki and Mattas 2010, Tsakiridou et al. 2008).

Examining food labelling related to healthy life attitudes, several studies found a positive link between the use of information on food labels and a high perception of a diet's healthfulness (Nayga 1996, Weaver and Finke 2003). Moreover, Kim et al. (2000) demonstrated a positive relationship between food knowledge and label use. However, Grunert at al. (2010) showed that the use of labelled information is mainly related to an interest in healthy eating, whereas the understanding of it is connected to consumer food knowledge. Finally, the relationship between food label use and consumers' attitudes toward food safety concerns is significant and positive (Kennedy et al. 2008, Bernues et al. 2003).

Methodology

The survey was conducted in the Lombardy region of northern Italy in 2007. The type of voluntary labelled meat attributes refer to those allowed by Regulation 1760/2000, which are currently reconfirmed by Regulation 653/2014 and by the Italian law (January 2015). Data were obtained from telephone interviews utilizing a questionnaire. Consumer responses totaled 1,025. Respondents were over 18 years old and residents of Lombardy, which corresponded to a sampling fraction of 0.1‰. The sample was stratified taking into consideration the regional share of gender, age, town, and province of residence (home ownership). It was representative of the Lombardy population. Due to missing values, the sample used for the estimations consisted of 999 consumers.

The response rate was 10.4% (the total number of contacts was 9,887). A previous pilot survey was conducted to test the questionnaire in order to maximize the response rate and minimize the error rate. The questions were arranged in a multiple-choice answer format with rating scales. Table 1 shows the demographic profile of consumers who responded to the questions about the use of meat labelling.

We can assume the following functional relationship among the groups of variables:

$$(1-4)\quad MI_{vi} = f\,(Sd_{vg},\ Qa_{vh},\ Hl_{vr},\ Ks_{vs},\ Fs_{vz,}\ e_{vi})$$

where:

$i = 1, ..., 999;\ v = 1, ..., 4;\ g = 1, ..., 6;\ h = 1, ..., 8;\ r = 1, ..., 3;\ s = 1, ..., 4;\ z = 1, ..., 3.$

The four equations (1-4) explain the use of the meat label and specific labelled information. MI_{vi} are binary variables (0 if the label or the single information is not used, 1 if consumers use the label) connected to (Table 2):

a. MI_{1i} – Meat label use;
b. MI_{2i} – Information on country of animal origin;
c. MI_{3i} – Information concerning the system of cattle breeding;
d. MI_{4i} – Information concerning the system of cattle feeding.

MI_{1i} consists of 999 consumers. The models $MI_{2i\text{-}4i}$ are subsets of M_{1i} and consider 710 consumers who read meat labels. 41% of them check for all information related to traceability. Concerning MI_{2i} only the 18% of those interviewed do not read information concerning origin. The high number of consumers who read the product origin confirms the great interest towards such information. In MI_{3i}, 41% of the consumers do not check for information regarding the system of cattle breeding. In $MI_{4i,}$ 33% of the consumers do not read information related to feeding, whereas the 67% do check for it.

Table 1. Profile of Consumers of the Survey

Demographic and Personal Characteristics	**Number**	**Percent**
Gender		
M	501	48.9
F	524	51.1
Age		
18-24	71	6.9
25-34	124	12.1
35-44	211	20.6
45-54	190	18.5
55-64	186	18.1
>64	243	23.7
Educational Level		
Primary School	163	15.9
Middle School	346	33.8
High School	399	38.9
College graduate and post graduate	117	11.4
*Income Level**		
Only with sacrifices (low)	181	17.7
Yes, but paying attention to expenders (medium)	501	48.9
Yes (high)	140	13.7
Yes, without problems (very high)	203	19.8

Note. * The capacity to cope with food shopping

Table 2. The Dependent Variables

Dependent Variables	Variable Description	Scale	N	Mean
Meat label use (MI_1)	Respondent checks the meat label. Yes=1; No=0.	0-1	1,025	0.75
Country of origin (MI_2)	Respondent checks the meat origin. Yes=1; No=0.	0-1	710	0.82
System of cattle breeding (MI_3)	Respondent checks the information labelled concerning the cattle breeding system. Yes=1; No=0.	0-1	710	0.59
Cattle feeding (MI4)	Respondent checks the information labelled concerning the system of cattle feeding. Yes=1; No=0.	0-1	710	0.67

The independent variables are 24 and they were grouped in the following five sets of variables (Table 3).

Sd_g, where g=1, …6, represents variables related to socio-demographic and individual characteristics of the consumers, i.e. age (scale from 1 to 6), gender (dichotomous scale), income (scale from 1 to 4), education (scale from 1 to 4), being shopper (dichotomous scale), and BMI (scale from 1 to 5).

Qa_h, where h=1, ...8, represents variables related to quality attributes of food products, i.e. the importance of price, origin of products, traceability, quality certifications (all measured by a scale from 1 to 5), product freshness, nutritional properties, ingredients, and best by date (all measured by a dichotomous scale).

Hl_r, where r=1, ...3, represents variables connected to healthy life attitude, and it includes three variables, i.e. dietary habits (scale from 1 to 5), sports habits, and smoking status (dichotomous scale).

Ks_s, where s=1, ...4, represents variables related to food knowledge and source of information. A scale from 1 to 5 is used to measure the variable food knowledge, where '1' stands for 'uninformed consumer' and '5' refers to 'very informed consumer'. This variable was created through an index obtained by four questions on items concerning cholesterol, fats, sugar and vitamins. We attributed '1' for all wrong answers and '5' for all four right answers. The variables related to the source of food information considered the different typologies consumers usually use to capture food information. These included: media (TV, radio, newspaper), experts (doctors, health authorities), and relatives or friends. These variables are expressed by a dichotomous scale.

Fs_z, where z=1, ...3, represents variables connected to food safety attitude, i.e. attention to food safety issues (scale from 1 to 5), the level of food safety perceived by consumers (scale from 1 to 5), and meat consumption variation after the BSE crisis (scale from 1 to 3).

Table 3. The Independent Variables

Independent Variables	Variable Description	Scale	N	Mean	S.D.
Socio-demographic and individual characteristics (Sd_g)					
Age	Respondent is 18-24 years old=1; 25-34 years old=2; 35-44 years old=3; 45-54 years old=4; 55-64 years old=5; >64 years old=6	1-6	1,025	4.00	1.56
Gender	Male=1; Female=2	1-2	1,025	1.51	-
Income	Is the monthly household income enough? Only with a lot of sacrifices=1; yes, but paying attention to expenditures=2; yes=3; yes, without problems=4	1-4	1,016	2.34	0.98
Education	Which is your degree? Elementary school-leaving certificate=1; Respondent has 8 years of obligatory education=2; High school education=3; University education or higher=4	1-4	1,025	2.46	0.89
Being shopper	Is the respondent the main food shopper? Yes=1; No=2	1-2	1,025	1.29	-
BMI	Five categories of Body Mass Index from underweight to obesity	1-5	999	2.99	1.41
Quality attributes (Qa_h)					
Price	Rating of importance of price on purchasing decision (from strongly disagree=1 to strongly agree=5)	1-5	1,023	3.75	1.10
Origin	Rating of importance of origin on purchasing decision (from strongly disagree=1 to strongly agree=5)	1-5	1,024	4.16	1.14
Traceability	Rating of importance of traceability on purchasing decision (from strongly disagree=1 to strongly agree=5)	1-5	1,022	4.29	1.05
Certification	Rating of importance of certification on purchasing decision (from strongly disagree=1 to strongly agree=5)	1-5	1,015	4.29	1.01
Freshness	Respondent controls the freshness of product Yes=1; No=0	0-1	1,025	0.94	-
Nutritional properties	Respondent checks nutritional properties of food products. Yes=1; No=0	0-1	1,025	0.55	-
Ingredients	Respondent checks food ingredients. Yes=1; No=2	1-2	1,025	1.41	-
Best by date	Respondent checks food expiry date. Yes=1; No=0	0-1	1,025	0.96	-
Healthy life attitude (Hl_r)					
Dietary habits	Respondent follows a balanced and varied diet: never=1; rarely=2; sometimes=3; very often=4; always=5	1-5	1,011	3.27	1.57
Sport habits	Respondent practices sport regularly=1; 2 otherwise	0-1	1,025	1.48	-
Smoking status	Respondent does not smoke=1; 0 otherwise	0-1	1,025	0.79	-
Nutritional knowledge and source of information (Ks_s)					
Infomedia	Primary source of food information is from media (Tv, newspapers, etc.)=1; 0 otherwise	0-1	1,025	0.59	-
Infoexpert	Primary source of food information is from experts (doctors, health authorities, etc.)=1; 0 otherwise	0-1	1,025	0.41	-
Infofriends	Primary source of food information is from friends and relatives=1; 0 otherwise	0-1	1,025	0.42	-
Food knowledge	Level of food knowledge (from uninformed consumer=1 to very informed consumer=5)	1-5	1,025	3.54	0.93
Food safety attitude (Fs_z)					
Attention to food safety issue	Respondent pays attention to food safety issues (from strongly disagree=1 to strongly agree=5)	1-5	1,022	4.48	0.82
Level of food safety perceived	The level of food safety is good (from strongly disagree=1 to strongly agree=5)	1-5	1,025	2.43	0.90
BSE effect	Meat consumption after the bse crisis (unchanged=1; decreased during the crisis=2; definetively decreased=3)	1-3	1,025	1.51	0.69

Four models were estimated based on [1-4] and, for all the equations, a binary logit model was used as the dependent variables are expressed in a dichotomy way. This model takes the following form (Bohrnstedt and Knoke 1994):

$$(5)\quad logit(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \sum_j \beta_j X_{ji} + e_i$$

where:

i =1,...999; corresponding to number of consumers;
p_i = probability of the dependent variable taking a value of 1;
j = 1,...24; corresponding to the number of independent variables;
X_{ji}= independent variables;
α = constant;
β_j = regression coefficients;
e_i is the error.

The variables of this model are usually non-metric (binary or categorical) (Upton and Cook 2006). Such variables can be measured by ordinal or nominal scales. To generate ordinal variables a 5 point Likert scale was used, where 1 corresponds to the minimum rank and 5 to the maximum rank that consumers assign to a certain behaviour or attitude. The adoption of the Likert scale was based on the fact that it is the most popular measurement scale in marketing (Mazzocchi 2008).

Equation (5) was estimated using the maximum likelihood estimation method. Pearson's Chi-Square Statistics confirms that all the models with included independent variables are significantly better than those models with just intercepts, and Nagelkerke's R^2 indicates an adequate goodness of fit.

Results

The survey reveals that the majority of consumers interviewed showed a high interest in different meat labelled information. More precisely, the most important information is the animals origin, in accordance with several empirical studies (Bernués et al. 2003, Roosen et al. 2003, Font I Furnols et al. 2011, Realini et al. 2013).

The results of the four logit models are shown in Table 4. Model MI_1 shows that some socio-demographic variables, such as, age (-0.154), gender (0.314), and income (-0.138), significantly affect the dependent variable 'meat label use'. Young people, female, and consumers with low income are more likely to use the meat label. According to other empirical studies (Drichoutis et al. 2005) the negative sign of income could be connected to the time pressure of high revenue consumers. Other possible explanations could be related to the higher time availability of students or young adults.

The variables connected to healthy life attitudes do not affect the dependent variable, whereas among the variables connected to product quality attributes: 'traceability' (0.156), 'certification' (0.153), 'product freshness' (0.632), 'best by date' (2.335), and ingredients (-0.669) have a

significant role in the model. This indicates that consumers who pay the most attention to information reported on food products are more likely to check meat labelling. Those respondents who obtained food information through the media were more likely to use meat labels (0.296). Moreover, the variable connected to the decrease in meat consumption after the BSE crisis is positive and statistically significant (0.221), indicating that consumers with a high safety risk perception are more likely to read meat labels.

Models MI_2 MI_3 and MI_4 reveal statistically significant and negative relationships with the independent variable 'level of food safety perceived'. These relationships suggest that consumers who seek specific information on meat labels are motivated by a low-level of food safety perceived. Label information is considered a method to reassure consumers of meat product safety.

Model MI_2 shows statistically positive relationships with the variables: 'BMI' (0.167), 'Ingredient' (0.829), and 'Food Knowledge' (0.285), and negative relations with the variables: 'Age' (-0.405) 'Education' (-0.614), and 'Level of food safety perceived' (-0.240). This model suggests that young people with a good level of food knowledge care about the origin of meat products. This could indicate that specific information is understood and considered important only by consumers who have a certain level of food knowledge. Moreover, they are interested in the ingredients of products, highlighting that consumers who check the origin of meat are interested in specific product quality and characteristics, which are usually not highly visible, due to the high proximity level of information. Model MI_3 concerning cattle breeding reveals statistically significant relations with the variables: 'Certifications' (0.170), 'Ingredients' (-0.406), 'Food Knowledge' (-0.159), and 'Level of food safety perceived' (-0.211). The positive sign of the variable 'Certifications' suggests that consumers looking at the information related to the system of cattle breeding are particularly interested in those quality attributes that are easily detectable by consumers (like PDO, PGI, etc.). Moreover, they do not seem interested in looking at labelled information with a high level of proximity, such as ingredients. As explained previously, specific labels in Italy have been created to communicate the characteristics of cattle breeding, which are often easily visible through specific signals put on the top of the meat package. Thus, MI_3 describes consumers' interest in quality signals for their food choices. Consumers checking for the system of cattle breeding do not appear to care about the meaning of the information transmitted by the labels. They prefer to look at simple and easily visible quality indicators in order to form quality and safety judgements regarding the meat. The variable for consumer knowledge shows a negative relationship with the dependent variable, suggesting that when the level of consumers' food knowledge is low, the use of this kind of information format is preferred.

Finally, model MI_4 concerning cattle feeding points especially to 'Age' (-0.253), 'Income' (0.156) 'Education' (-0.327), 'BMI' (0.157), 'Traceability' (0.194), and 'Level of food safety perceived' (-0.180) as significant variables. Young people with a high income level seem to be more interested in such information. Moreover, the positive sign of the variable 'Traceability' indicates that consumers who read such information are particularly interested in the safety characteristics of food products.

Table 4. Estimates of the Four Models

	Meat Label Use (MI_1)		**Country of Origin (MI_2)**		**Cattle Breeding (MI_3)**		**Cattle Feeding (MI_4)**	
	β	Sig.	β	Sig.	β	Sig.	β	Sig.
α	-3.508	0.005	-4.408	0.000	-3.030	0.469	-3.939	0.419
Socio-demographic and individual characteristics (Sd_g)								
Age	**-0.154**	0.008	**-0.405**	0.000	-0.020	0.757	**-0.253**	0.000
Gender	**0.314**	0.072	-0.211	0.385	-0.298	0.110	-0.049	0.800
Income	**-0.138**	0.087	0.163	0.159	-0.009	0.917	**0.156**	0.092
Education	0.032	0.740	**-0.614**	0.000	-0.128	0.233	**-0.327**	0.003
Being shopper	-0.099	0.596	0.193	0.466	-0.049	0.804	0.188	0.365
BMI	0.073	0.523	**0.167**	0.054	0.043	0.519	**0.157**	0.025
Quality attributes (Qa_h)								
Price	0.050	0.493	-0.093	0.366	-0.086	0.274	-0.113	0.172
Origin	-0.044	0.586	-0.094	0.430	-0.046	0.593	0.069	0.442
Traceability	**0.156**	0.073	0.130	0.329	0.134	0.184	**0.194**	0.063
Certifications	**0.153**	0.067	0.103	0.432	**0.170**	0.098	0.055	0.603
Freshness	**0.632**	0.089	0.636	0.318	-0.257	0.618	0.667	0.198
Nutritional properties	-0.108	0.253	-0.074	0.752	0.140	0.421	0.180	0.324
Ingredients	**-0.669**	0.000	**0.829**	0.003	**-0.406**	0.029	-0.011	0.956
Best by date	**2.335**	0.000	-18.993	0.999	0.619	0.512	-0.675	0.557
Healthy life attitudes (Hl_r)								
Dietary habits	0.281	0.128	0.020	0.783	0.030	0.594	0.068	0.247
Sport habits	0.220	0.169	0.126	0.567	-0.116	0.490	0.012	0.948
Smoking status	-0.047	0.347	0.200	0.449	0.221	0.280	0.196	0.355
Nutritional knowledge and source of information (Ks_s)								
Infomedia	**0.296**	0.062	-0.146	0.521	0.197	0.255	0.088	0.627
Infoexpert	0.245	0.148	0.213	0.346	0.190	0.276	0.103	0.572
Infofriends	-0.035	0.831	-0.194	0.385	-0.042	0.808	0.065	0.716
Food knowledge	0.087	0.291	**0.285**	0.016	**-0.159**	0.081	0.026	0.781
Food safety attitude (Fs_z)								
Attention to food safety issue	0.042	0.692	-0.065	0.706	0.076	0.529	-0.108	0.406
Level food safety perceived	0.089	0.322	**-0.240**	0.052	**-0.211**	0.026	**-0.180**	0.069
BSE effect	**0.221**	0.056	-0.169	0.252	0.017	0.886	-0.138	0.260
Chi-Square (Sig. 0.000)	130.43		67.21		42.80		45.13	
Nagelkerke R Square	0.18		0.15		0.08		0.09	

Concluding Remarks

This study extends previous research by examining consumer attitudes towards information concerning animal origin and cattle breeding and feeding systems. Empirical analysis shows that Italian meat consumers are generally interested in obtaining this type of information. Favorable attitudes towards product labelling could be related to a loss of trust in authorities and the food chain after a series of food safety scandals in the European Union. Besides adopting policy measures to guarantee meat safety, labelling systems have played an important role to regain consumers' trust in the European beef production.

In Italy different types of meat labels have been introduced by public and private regulation. The information concerning the systems of cattle breeding is usually easily visible through big characters and brightly colored labels. Information related to the animal origin and cattle feeding is part of the meat traceability label or firm label which usually contains high proximity information related to date of birth, animal gender, name and place of cattle farm, race, name of slaughterhouse, and date of slaughtering.

The models analysed in this paper reveal that reading meat labels is linked to the level of perceived meat safety. Thus, traceability labels are a good instrument to help regain consumer confidence in the safety of meat products.

The analysis found that consumers using meat labels show an interest in most product quality attributes. This means that meat label readers are inclined to use product information to guide their purchasing preferences.

Moreover, it is possible to highlight different aspects of specific labelled information which may influence the use of such information. The first relates to 'visual clutter' of labelled information. The analysis reveals that cattle breeding information is used by consumers who have positive attitudes towards meat quality indicators (certifications), and are easily visible during product selection. On the other side, information on meat origin and cattle feeding is used by consumers who look for specific labelled information with a high proximity level during product selection, such as the list of ingredients and traceability labels.

The second aspect that seems to impact the use of different labelled information relates to consumers food knowledge. The level of food knowledge influences the use of information related to meat origin (positively) and cattle breeding (negatively). Such results suggest that certain types of information are used on the basis of the consumers' ability to comprehend labelled information.

Another interpretation of our results could be explained by Grunert's Total Food Quality model (Grunert 2005). According to this model, the use of different labelled information by consumers may be linked to the information they perceive as important during decision-making. More precisely, consumers checking for the origin of meat seem to pay attention to the ingredients in order to form quality judgements. Consumers interested in information regarding cattle breeding are using information on voluntary certification schemes to form purchasing preferences. Consumers looking at cattle feeding information pay attention to product traceability.
This analysis allows us to draw policy and managerial implications. The voluntary meat labelling seems to have positive effects on consumers. Meat labelling allows consumers to make more informed choices. Increased transparency allows consumers to make choices in line with their preferences and gives food producers the opportunity to regain consumer trust after repeated food scares within this sector.

From a managerial point of view, this paper confirms that quality attribute labelling related to meat processing engages consumers' positively. Most consumers read meat label information; therefore, highlighting is a good strategy for firms if they want to differentiate their meat products.

The differentiation of meat products through labelled information can also have a positive effect on other segments of the supply chain. For example, labelling different quality attributes could offer livestock farms a way to differentiate meat products and gain premium prices. Moreover, the certification of meat information can imply more coordinated governance of vertical relationships due to an increase of transaction bilateral dependency and the implementation of new selection procedures for raw materials or new breeding methods (Banterle et al. 2006).

However, as firms develop differentiation strategies for their products they should consider two important observations found to influence consumer purchasing behaviors. The first relates to the quantity of credence attributes on labelling. Consumers are often not able to process all information contained on product packaging and labels because of bounded rationally or time constraints. This can lead to consumer confusion or a lack of interest in labelled information. Therefore, an effective choice of mixed attributes should be placed at the center of the firm's communication strategy.

The second aspect concerns the consumer target the firm decides to reach through labelling. Empirical analysis highlights that consumers seek different information from meat labels. Some pay attention to voluntary certification schemes which are usually easily visible by color and dimension. These consumers do not reveal adequate food knowledge suggesting that they do not really care about the meaning of the information labelled, but they use it just as a quality indicator when making food choices. In this scenario the firm communication strategy should be oriented especially on the visual presentation, in order to capture consumer attention. Other meat consumers are not influenced by a label's 'visual clutter' but by specific labelled information, such as ingredients and/or traceability. The communication strategy related to consumers interested in such information should be concentrated on the information reliability transmitted by the label. In this case further explanations of the meat labelled attributes could help increase consumer awareness and trust when making meat choices. However, further research is needed to verify if it is possible to draw different consumers' profiles on the basis of the labelled information on meat products using, for example, cluster analysis. Moreover, future analysis could also further examine the role visual characteristics of labels have on consumer choices in other European countries.

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Who is Drinking Wine in the United States? The Demographic and Socio-Economic Profile of U.S. Wine Consumers (1972-2012)

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Abstract

This article presents a historical, empirical, and econometric description of American wine consumers' demographic and socioeconomic characteristics (1972-2012). By the application of a general demand model that specifies the years of change in the structure of wine consumption in the U.S., it is shown that the evolution of wine consumption in the U.S. between 1972 and 2012 has three distinct stages; a first stage of growing wine consumption, a second stage of decline of wine consumption, and a third stage of recovery and substantial growth of wine consumption. With a model identifying the demographic and socioeconomic profile of the average American wine consumer for those years, it was then discovered that wine used to be a product associated with higher income, higher education level consumers; and it is now described as a product consumed by the younger generation, married people, and women..

Keywords: wine, US, consumption, profile

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Introduction

The United States, the third most populous country globally, is expected to reach twice its 1972 population level in the coming decade. Not only has the population almost doubled in size, nowadays the population has become qualitatively different from what it was in 1972 (Shrestha and Heisler 2011). As noted by the Bureau of the Census (2014), "The U.S. is getting bigger, older, and more diverse". The demographic changes that have already occurred since 1972 will reshape the nation in the decades to come; longer lives, fewer babies, more immigrants. It is important to recognize that this inexorable demographic momentum has important implications for the economic and social forces that shape societal well-being, and consumption patterns.

The United States is now the largest consumer and importer of wine in the world, with a prospect for growth. It is still the fourth largest wine producer; and its exports, though slowed, are growing. The United States, with over 330 million people in 2012, and a long tradition of wine production and consumption; is the country to watch over the coming decades. But, what actually happened in the last four decades? How could a country that forty years ago, was certainly not a major wine consumer could become, in recent times, the largest wine consumer in the world?

The historical, demographic, and socioeconomic analysis of American wine consumers is then valid and relevant. Who was in 1972, and is now, drinking wine in the United States? What is the demographic and socioeconomic profile of those wine consumers?

The objective of this article is to define the profile of wine consumers in the U.S. in terms of a set of demographic and socioeconomic variables during the forty years (1972-2012), in which there has been a substantive growth in wine consumption.

In the last few decades wine consumption patterns have undergone some remarkable changes. While in traditional wine producing countries there has been a rapid and significant decrease in domestic demand, new market opportunities have emerged in areas historically lacking a wine culture (Foster and Spencer 2002, Pomarici et al. 2012). The latter is the case of the United States, Northern European countries, and South East Asian countries where wine is being increasingly appreciated and growing in demand, even partially substituting traditional local alcoholic beverages (Cicia et al. 2013).

Some authors (Anderson 2004, Smith, and Mitry 2007) believe that the globalization process is driving to a convergence in wine consumption patterns by creating similar structural models of consumption. Dal Bianco et al. (2013) tested and corroborated this hypothesis of convergence by: analyzing per capita wine consumption in key world markets over the past fifty years, analyzing the dynamics of world wine consumption, and checking for the existence of a macro-tendency towards a common consumption style; despite differences in taxation, economic policies and distribution systems among countries.

This assumption is not surprising at all given that the demand for wine has historically been influenced by social, religious and cultural aspects (Banks and Overton 2010, Lee 2009). The internationalization of local markets has likely diminished these cultural differences among

countries by means of the so-called "taste standardization" process (Aizenman and Brooks 2008), and the United States is not an exception to this situation.

The United States overtook France as the leading consumer country of wine in the world in 2012; it has also become the world's largest importer of wine by volume. In 2012, almost 30 million hectoliters of wine were consumed in the U.S., while in traditional France, consumers drank 28 million hectoliters of wine (O.I.V. 2014). Wine consumption per capita was 105.6 liters in France in 1972 while it was only 6.09 liters in the U.S.; wine consumption per capita was 46.2 liters in France in 2012 and 10.33 liters in the U.S. The U.S. wine consumption has more than doubled, as opposed to the French consumption which has almost been cut in half (See Table 1). All this has happened even though the average cost of wine in the U.S. (in real terms) has increased more than ten times in the same period of time (Wine Institute 2014).

Table 1. Wine consumption in the U.S. and France (1972 and 2012)

	United States		**France**	
	1972	**2012**	**1972**	**2012**
Total Wine Consumption (Millions of Hectoliters)	13	30	55	28
Wine Consumption per Capita (Liters per Year)	6.09	10.33	105.6	46.2

Source. Wine Institute and O.I.V (2014).

Until the mid-eighties, the growth of wine consumption was due to an educated urban population with high purchasing power (Bardaji 1993). From that date, consumption of wine in the U.S. suffered a decline due to various factors, including: the increase of the minimum age for consumption of beverages, which became 21, and the change of labeling laws, forcing producers to note on the label the effects of alcohol consumption and the content of sulfite in wine (Martin de Mulas 2009). It is from the nineties when the consumption of wine began to become increasingly important, and that was caused to a certain extent, by the pressure exerted by industry institutions, i.e. Farm Bill of 1990 and Congressional Committee on Agriculture of 1991 (Bardaji 1993).

The wine market at the beginning of the twentieth century in the U.S. is heterogeneous; 50% of its consumption is concentrated in just six states: California, New York, Florida, Texas, Illinois, and New Jersey; the other 50% of wine consumption is distributed among the other 44 states (The Beverage Information Group 2013) (See Table 2).

Twenty major U.S. states (California, Florida, New York, New Jersey, Texas, Illinois, Massachusetts, Washington, Virginia, Ohio, Michigan, Pennsylvania, Arizona, North Carolina, Georgia, Maryland, Wisconsin, Connecticut, Oregon, Colorado), accounting for 73.8% of the population, concentrated near the 80.9% of total U.S. wine consumption in 2012 (The Beverage Information Group 2013) (See Table 2).

In the U.S., wine is sold with different regulations by state. A state is “Controlled” when the government distributes alcoholic beverages. There are 17 states and a county (Montgomery County, Maryland) that are controlled. Although the formula varies from state to state, generally

the state acts as a wholesaler of spirits and, in some cases, also as wine wholesaler. In twelve states, the government also operates or controls the retailers' facilities. It is considered that a state is "Non-Controlled" when the government does not actively participate in the distribution of wine and / or liquor (The Beverage Information Group 2013). By type of state, 80.5% of the wine consumed in the United States in 2012 was consumed in "Non-Controlled States", whose population corresponds to 74% of the U.S. adult population (The Beverage Information Group 2013) (See Table 2).

Table 2. U.S. Wine Consumption (2012)

30% in only the first six metropolitan coastal areas	**50% concentrated in six states (all "Non-Controlled States")**	**80% concentrated in twenty states (mostly "Non-Controlled States")**	
New York-Newark-Edison	California	California	Michigan
Los Angeles-Long Beach-Santa Ana	New York	New York	Pennsylvania
Chicago-Naperville-Joliet	Florida	Florida	Arizona
Boston-Cambridge-Quincy	Texas	Texas	North Carolina
San Francisco-Oakland-Fremont	Illinois	Illinois	Georgia
Miami-Ft. Lauderdale-Miami Beach	New Jersey	New Jersey	Maryland
		Massachusetts	Wisconsin
		Washington	Connecticut
		Virginia	Oregon
		Ohio	Colorado

Source. The Beverage Information Group (2013)

California was the state with the highest consumption (18.2%) by volume in 2012, well away from Florida which ranks second with 8.2% (The Beverage Information Group 2013). As for per capita consumption in 2012, the first position was the District of Columbia, with a consumption of almost 26 liters per capita; and New Hampshire in second place consuming nearly 20 liters per capita (Kiersz 2013). At the other end, West Virginia and Mississippi - with respectively 2.4 and 2.8 liters per capita - were the states with the lowest wine consumption per capita (Kiersz 2013) (See Figure 1).

Wine was consumed in the major metropolitan areas of the country, where much of the population is concentrated. About 62% of the total national wine consumption in 2012 was done in thirty-five major metropolitan areas, and over 30% in only the first six metropolitan areas (New York-Newark-Edison, Los Angeles-Long Beach-Santa Ana, Chicago-Naperville-Joliet, Boston-Cambridge-Quincy, San Francisco-Oakland-Fremont, and Miami-Ft. Lauderdale-Miami Beach) (The Beverage Information Group 2013). The consumer of wine in the U.S. is mainly in near-coastal states, and in particular, in large metropolitan areas (Table 2).

The New Strategist Editors in their "The Who's Buying Series - Who's Buying Alcoholic and Non-Alcoholic Beverages" (2011) described that in the U.S., wine at home was best consumed in 2010 by a customer group of householder's aged 45 – 74, married without children, non-Hispanic whites, located in the northeast and west region, and college graduates. They also described that wine at restaurants and bars were best consumed by a customer group of

householder's aged 35 to 64, married without children, or married with adult children (above 21), Asians, households in the northeast, and college graduates.

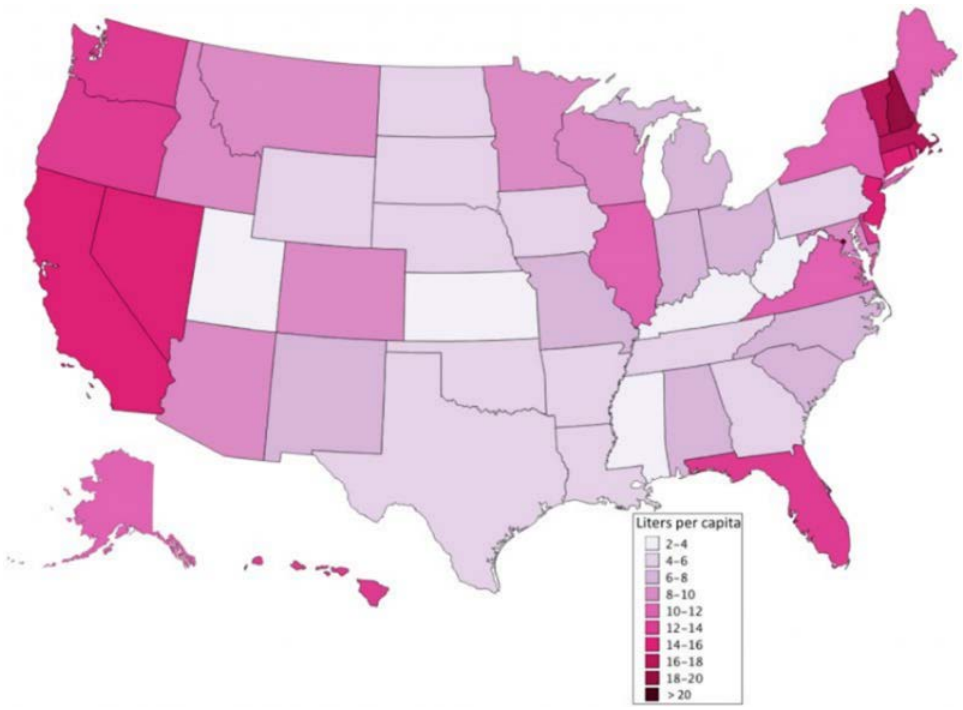

Figure 1. Wine consumption per capita in the U.S. (per state, in liters, 2012)
Source: Kiersz (2013).

Comparing with prior research in the areas of wine consumer demographics and wine consumer behavior, the extant academic literature has focused primarily on wine consumer behavior, being that wine consumer demographics is a novel area of research; there has been limited demographic profiling of the wine consumer in academic literature.

The existing academic literature of wine consumer behavior in the U.S. has been analyzed, and as mentioned before, the globalization of the wine industry and its implications for the U.S. wine industry and its consumers has been an important topic of research (see for example: Silverman et al. 2003; Cholette et al. 2005, Hussein et al. 2008).

Some other academic literature focuses in empirical studies that examine U.S. and international wine consumers' behavior and characteristics. This vast literature deals with consumers' responses to price changes (Antoniolli et al. 2011, Estrella Orrego et al. 2012, Caracciolo et al. 2013); the influence of specific geographical traits and other qualitative wine characteristics on consumer preference (Lockshin et al. 2006, Gallet 2007, Tempesta et al. 2010); ways in which differences between products are communicated to the public (Boatto et al. 2011, Sam and Thompson 2012); and the launch of promotional campaigns to boost wine consumption in emerging wine consuming countries (Pappalardo et al. 2013).

Some other authors like Olsen et al. (2003), Thach and Olsen (2004), and Nowak et al. (2006) examined how different consumer characteristics impact wine choice, wine life-cycle, and brand equity. Thach and Olsen (2006) described the perception and attitude of 108 echo boomers, also known as the millennium generation; and Atkin and Thach (2012) studied the millennium generation and their information search procedures in wine choice. In the same line of research, Olsen et al. (2007) described how four different cohorts of core U.S. wine consumers, the Millennials, Gen Xers, Baby Boomers, and Traditionalists, were first introduced to wine, and their current wine consumption preferences.

An interesting work of literature that focuses on empirical results in order to understand the behavior characteristics of American wine consumers is a study sponsored by Constellation Wines. This study mapped a segmentation of U.S. wine drinkers; it was found that premium wine consumers in the U.S. can be categorized into six segments: enthusiast, image seeker, savvy shopper, traditionalist, satisfied sipper, and overwhelmed (Constellation Wines 2005).

If the existing academic literature of wine consumer demographics is analyzed, it is interesting to see that wine consumption dynamics are continuously monitored by international organizations such as the O.I.V. (Organisation Internationale de la Vigne et du Vin – International Wine Organization), the F.A.O. (Food and Agriculture Organization), and the W.H.O. (World Health Organization), but few studies have empirically investigated the demographics of wine in a certain geographical area and its historical evolution.

There have been only a few rigorous academic studies of wine consumers and the determination of their demographic and socioeconomic profile, some in Australia and New Zealand (Bruwer, et al. 2002, Thomas and Pickering 2003, Johnson and Bruwer 2003, Bruwer and Li 2007), in Argentina (Yvon 2007), in South Africa (Ndanga et al. 2009), in China (Camillo 2012), in Chile (Palma, et al. 2014), and particularly very few in the U.S. (Bardaji 1993, Hussain et al. 2006). These papers employ different techniques to understand domestic consumer demographics and to provide with a description of wine consumer profiles, mainly using psychographic variables, and qualitative analysis.

There has been a severe paucity of econometric analysis of the determinants of the demographic and socioeconomic profile of wine consumers in the U.S. Only recently, and being probably the first study of this kind, Hussain et al. (2006) studied 122 wine consumers from Northern California using an econometric analysis with the aim of understanding the determinants of their consumption patterns. Hussain et al. (2006) "used some demographic variables (age, gender, income, occupation, race), as well as behavioral variables (uses, benefits, influences, consumption volume, expenditure on wine), and knowledge level related to wine consumption." They then extrapolated their results, consumer characteristics, and the determinants of wine consumption, to the overall population of wine consumers of the U.S., a practice that this article tries to improve.

Consumer demand for a wide variety of wines — both American and imported—has exploded in recent years in the United States (Gallego 2014). As a result, new specialty wine varieties (such as "Moscato") have been introduced, and retailers now offer many wine-related products, such as sparkling wine and wine coolers. "As a result of the upsurge in consumer demand, many food

retail outlets, including conventional supermarkets and mass merchandisers, have added wine to their shelves, increasing consumer access to the product" (Constellation Wines 2005). As the wine market grows, a natural question arises: who is buying wine? Gaining insight into this issue is more than just an intellectual exercise, as retailers and members of the wine industry (for example, farmers, wineries, distributors) can increase their profits by understanding who buys their wines.

This article presents a historical, empirical, and econometric description of American wine consumer's demographic and socioeconomic characteristics within the years 1972 and 2012. Data analyzed and correlated correspond to official U.S. Bureau of the Census variables (age, gender, race and ethnicity, household income, level of education, and national income - GDP), and U.S. Wine Institute variables (wine consumption in volume and per capita, and production). In this article, wine has been treated as a homogeneous good, while acknowledging that there are several wine categories; the data set on "wine consumption in volume" by the U.S. Wine Institute does not discriminate by type of wine, it only accounts the total liters of wine consumed during a year.

This article does not provide a formal hypothesis; but explains, and empirically explores, how different demographic and socioeconomic characteristics of American consumers influence wine consumption.

The article is structured as follows. Section one presents the methodology applied to define 1) the general demand model that specifies the years of change in the structure of wine consumption in the U.S. from 1972 and until 2012 (forty years), and 2) the model to identify the demographic and socioeconomic profile of the average American wine consumer for those years; considering intrinsic individual variables like age, gender, race, ethnicity, education level, household income, family structure, and beer consumption per capita since it is a traditional substitute product of wine. Section two provides the econometric results, and an analysis of the wine consumer demographic and socioeconomic profile in the U.S. Finally, the conclusion, and the references are presented.

U.S. Wine Consumers: Applied Methodology to Determine a Demographic and Socioeconomic Profile

The evolution of wine consumption in the U.S. between 1972 and 2012 shows three distinct stages: the first stage of growing wine consumption goes from the beginning of the seventies until the mid-eighties; the second stage of decline of wine consumption goes up to the mid-nineties; and the third stage is of recovery and substantial growth of wine consumption and goes from the mid-nineties until the end of the period of analysis, 2012 (Bardaji 1993 and Gallego 2014).

To identify if the determinants of those changes were the traditional variables of price and income, or if the determinants were related to a change on the consumer profile, a general model of demand for wine consumption is specified and estimated. Its analytical expression is:

(1) $DV_t = f(Wine\ Price_t, GDP_t, Beer\ Price_t)$

Where *DVt* is the quantity demanded of wine and as a substitute product, beer is selected. In the general demand function for wine consumption, the fundamental variables are the price of wine, the income, and the price of a substitute good. In this case the price of beer has been chosen as the price of the substitute good. Beer is the most consumed alcoholic beverage in the U.S. in the period of analysis. According to the theory of demand, an inverse relationship between quantity demanded of wine and the price of wine should exist, and a positive relationship between quantity demanded of wine and income or the price of beer should be expected. Between the types of demand function identified in Caraballo (2003), i.e. linear, exponential and potential, the suitable functional form for the sample data used in this paper is the exponential. Caraballo (2003) notes the exponential functional form is the best to use from a practical point of view, and Mahía (2004) adds that the parameters of a model in logarithms are especially useful for studying the demand. Econometric tests will show that in this case the exponential function is also the most suitable. Thus, the analytical expression of the model (1) is:

(2) $DV_t = \alpha_0 WinePrice_t^{\alpha 1} GDP_t^{\alpha 2} BeerPrice_t^{\alpha 3} e^{ut}$

The Chow test (Table 3) showed the presence of three structures in model (2), coinciding with the changing trends in wine consumption mentioned before. The estimate of a single model in the presence of two or more structures cannot capture these different realities. Compared with the results obtained with estimated models for each of the separate sub-samples, these results would be biased and inconsistent, that is, results would be far from the actual values of the existing sets of parameters (Pulido and Perez 2001). However, the reasons for these changes were not due to price changes (of wine or its substitute good) or income; the contrast of Harvey-Collier (Table 3) did not indicate variations of these parameters in the period. Therefore, the structural change has been marked each time by variables other than the fundamentals of a demand function, variables such as the socioeconomic characteristics of consumers. Following authors like Bardaji (1993), FOCIR (Fondo de Capitalización e Inversión del Sector Rural) (2005), Hussain et al. (2006), and Dettmann and Dimitri (2010); this article proposes a model that captures the evolution of the characteristics of U.S. wine consumers at each stage; to avoid biased, inconsistent and inefficient parameters and errors in the application of contrasts. Mahía (2011) indicates that the estimation of a single model cannot capture the various trends that present the endogenous variable; therefore the model is specified for each stage and is as follows:

(3) $DV_t = f(age_t, gender_t, race_t, education_t, household\ income_t, marital\ status_t, beer\ consumption_t$

Model (3) is estimated for each subsample identified by the Chow test, i.e. one for the period 1972-1984 (Model 3a), one for the period 1985-1993 (Model 3b), and the last for the period 1994-2012 (model 3c). For the detection of the functional form (3a, 3b and 3c), the Box-Cox technique was used. This technique, as Arrufat (1997) points out, allows testing hypotheses referred to the appropriate functional form. In order to understand wine consumption in the U.S. and determine a demographic and socioeconomic profile of American wine consumers, the variable "Wine Consumption" is dependent on a set of intrinsic demographic and socioeconomic consumer characteristics or exogenous variables, such as age, gender, race, education level, marital status, and the consumption of beer, a substitute product. The same approach has been used in studies such as Camillo (2012) for the Chinese consumer of wine and Hussain et al.

(2006) for the San Francisco wine consumer. The expected sign for age, education level, household income, and marital status is positive according to Bardaji (1993). According to Hussain et al. (2006) white people drink more wine and women drink more wine than men in the U.S.

The functional form of model (3a) for the first period (1972-1984) resulted on the application of the exponent (0) to the endogenous variable:

$$(3a) \quad lDV_t = \beta_0 + \beta_1 age_t + \beta_2 gender_t + \beta_3 race_t + \beta_4 education_t + \beta_5 household\ income_t + \beta_6 marital\ status_t + \beta_7 beer\ consumption_t + u_t$$

t=1972-1984 (first period)

For the second period the exponent (-1) was applied on the dependent variable and the exogenous constant variables.

$$(3b) \quad \frac{1}{DV_t} = \beta_0 + \beta_1 age_t + \beta_2 gender_t + \beta_3 race_t + \beta_4 education_t + \beta_5 \frac{1}{household\ income_t} + \beta_6 \frac{1}{marital\ status_t} + \beta_7 \frac{1}{beer\ consumption_t} + u_t$$

t=1985-1993 (second period)

For the third period, the exponent (-1) was also applied.

$$(3c) \quad \frac{1}{DV_t} = \beta_0 + \beta_1 age_t + \beta_2 gender_t + \beta_3 race_t + \beta_4 education_t + \beta_5 \frac{1}{household\ income_t} + \beta_6 \frac{1}{marital\ status_t} + \beta_7 \frac{1}{beer\ consumption_t} + u_t$$

t=1994-2012 (third period)

The selected functional form of the general demand model (1) was the exponential (2). The reasons are, first, because the Sum of the Squared Residuals (SSR) was lower in the exponential form than in the linear form (0.547301 versus 1.71e+18); and second, because the Ramsey's RESET contrast (squares and cube: F = 1.046142, p = 0.353; squares only, F = 0.066045, p = 0.799; cubes only, F = 0.060445, p = 0.807) indicated the correct specification of the exponential function with an associated p-value greater than 0.05 and the non-need to prove with the potential formulas. On the other hand, it has been implemented a robust estimate in model (2) due to the existence of autocorrelation (Durbin-Watson d-statistic (4, 40) is 0.1436572) and heteroskedasticity (White heteroskedasticity contrast, LM is 25.5185 with a p value of 0.00244808).

This one is a model without collinearity, as shown with the reciprocal condition number close to zero (7.9829705e-006). On the other hand, the Chow test for 1985 and 1994 showed, with a probability of less than 0.05, a structural change in the endogenous variable but not on the slope coefficients.

Table 3. Chow test and Harvey-Collier test

Chow test and Harvey-Collier test	
Chow Test of the structural change in the observation 1985	Chi-squared (4) = 212.221 (p = 8.84249e-045)
Chow Test of the structural change in the observation 1994	Chi-squared (4) = 269.295 (p = 4.52665e-057)
Harvey-Collier t(35) = 1.58018	P(t(35) > 1.58018) = 0.123062

This result implies biased, inconsistent and inefficient parameters and errors in the application of contrasts; the estimated model is invalidated (Mahía 2011). Hence we do not focus on the contrast of individual significance (t-test) or joint significance (F-Snedecor). On the other hand, the Harvey-Collier contrast indicated the stability of the estimated coefficients in the whole period; the price of wine, the GDP, or the price of the substitute good, do not explain the changing trends in wine consumption.

As a solution to the structural change, the sample is divided into the three sub-sample periods marked by the Chow test: 1972-1984, 1985-1993, and 1994-2012. As exogenous variables a set of socioeconomic factors are chosen, factors that largely define the U.S. wine consumer profile (models 3a, 3b, 3c).

The variables specified for this study are presented in Appendix A1 and the statistical descriptors in Table 4. Because the time period spans forty years, the dispersion is found in the variables.

Table 4. Statistical Descriptors

Variables	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Wine Consumption	40	2.10e+09	4.97e+08	1.31e+09	3.24e+09
Wine Price	40	9.06675	3.569833	3.043383	13.3671
GDP	40	9.03075	2.942433	4.85	13.67
Age	40	3.025	1.270726	1	5
Gender	40	1.525	0.5057363	1	2
Race	40	1.825	0.3848076	1	2
Education	40	1.725	0.4522026	1	2
Household Income	40	65321.34	7732.906	53467	76180
Marital Status	40	53.00175	4.078855	46.3	59.12
Beer Consumption	40	2.20e+10	2.26e+09	1.61e+10	2.49e+10
Beer Price	40	3.715039	0.223163	3.375521	4.204248

U.S. Wine Consumer Demographic and Socioeconomic Profile: Results and Implications

To identify the profile of the U.S. wine consumer in each period the Box-Cox technique is applied. In the period 1972-1984 the p-value associated with the LR test (see Appendix, Table A2) for the exponent (1) shows, in most cases, that there is no need to make any transformations, although the exponents (-1 and 0) could be suitable alternatives. The Box-Cox procedure was also identified through the models lhsonly, rhsonly, and lambda, as well as other exponent values (see Appendix, Table A3). All options were estimated and the functional form with a lower Sum of the Squared Residuals (SSR) (See Appendix, Tables A2 and A3) was selected. Thus, a transformation on the endogenous variable with a power of (0) was applied. In the period 1985-1993 the LR contrast identified as valid the exponents (-1, 0, 1), and the theta and rhsonly models also identified other exponents. The Sum of the Squared Residuals (SSR) drew exponent (-1) as the most suitable, both on the endogenous variable and on the exogenous ones. Finally, for the period 1994-2012 the results of the LR test and those from the lhsonly, rhsonly, and lambda models as well as the Sum of the Squared Residuals (SSR) also showed exponent (-1) was the most suitable.

The Ramsey's RESET contrast (see Appendix A4), with a p-value greater than 0.05, indicated the correct specification of the three models, therefore the estimated models were valid. The F-Snedecor, with a p-value less than 0.05, is a representative measure of the overall ability of all explanatory variables of the endogenous variable. They are models without multicollinearity as shown by the fact of an Inflation Variance Factor with a value of less than ten. Furthermore, the Breusch-Pagan, with p-values greater than 0.05, is showing no heteroskedasticity within the models and therefore random perturbations keep the same dispersion for all observations. The Breusch-Godfrey test also indicates no heteroskedasticity. Finally, the Sum of the Squared Residuals (SSR) is close to zero and follows a normal distribution.

As for the individual significance of the estimated parameters of models 3a, 3b, and 3c, as shown in Appendix A4, it is important to note that in the first period, 1972-1984, marital status with a significance level of 10%, and household income with a significance level of 1%, are the only variables that are significant and positively influenced the increased consumption of wine.

As for the second period, 1985-1993, to the above variables, education level should be added; all variables had a significance level of 1% and also favored wine consumption. These results are the same as the results presented in Bardaji (1993).

It is in the most recent period (1994-2012), when marital status (married), with a significance level of 1%; gender (women), with a significance level of 5%; and age (younger generations), with a significance level of 1%, identify the American wine consumer and show the variables that influence the increased consumption of wine in the U.S. Different studies of the U.S. wine market profile characteristics, i.e. Martin de Mulas (2009) and Thach (2014), concluded the same. Others like Hussain et al. (2006) agree on the newly significant importance of the younger population on wine consumption in the U.S., but instead their results did not show the importance of marital status (married). It is noteworthy that household income has ceased to be a

relevant factor; although and as per Gallego (2014) large consumers remain those with higher family income.

In the forty year period of this study, 1972-2012, it is observed that in the mid-90s there was a change in the American wine consumer profile, moving from a predominantly older individual with higher income and higher level of education to a consumer with a more younger, more feminine profile, where income or educational level were not significant factors. The marital status (married) remained a significant factor in the forty years of the study.

This article results corroborate what the Wine Market Council identified in their "The U.S. Wine Market Consumer Trend & Analysis Report" (2014): 1) women are more into wine than men; women more habitually drink wine than men; and women drink more table, imported, sparkling, and fortified wine than men; and 2) younger generations are becoming to be important consumers of wine. Generation X and Millennials, which represent 20% and 28% respectively of habitual wine consumers in the U.S., consume more wine than the wine consumed by the Baby-Boomers at their age, pointing to a sustainable growth of wine consumption (Wine Market Council 2014).

Race is not significant in any period; this represents a different result of what Hussain et al. (2006) pointed out when they described the San Francisco wine consumers as more White (considering the San Francisco wine consumers as to be representative of the American average consumer).

Beer was not significant as a substitute for wine, either in the general demand model or in the three models or profiles. This information corroborates what the Wine Market Council states in their Report (2014); the United States is a beer consumption country with beer having an 81% of the market share. However, it is interesting to see that the segmentation of the beverages market in the U.S. shows that in 2012, almost 100 million consumers (44%) chose wine as their first choice of alcoholic beverages compared to around 80 million (35%) of Americans that informed they were abstemious, and almost 50 million consumers (22%) that chose beer and spirits as their preferred alcoholic beverage (Wine Market Council 2014).

Even though the wine culture of the U.S. remains new, heterogeneous, and concentrated, wine consumption in the U.S. has had an increasing rate and is expected to continue to increase, becoming a more popular product, closer to the younger generations, and women.

Conclusion

"Who was then and is now drinking wine in the United States? What is the demographic and socioeconomic profile of those wine consumers?" were the relevant questions this article presented in its introduction. Interestingly enough, it is now evident that wine in the United States is a beverage that is becoming more popular, more democratic. Forty years ago, it used to be a product associated with higher income and higher education level consumers. It is now described as a product consumed by the younger generation, married people, and women.

Through a forty-year period, using an econometric analysis of demographic and socioeconomic variables of the United States population, this article tested the fact that the United States wine market and its patterns of wine consumption are changing. U.S. wine consumers follow a demographic trend that shows them younger, probably an interesting contradiction to certain stereotypes of wine connoisseurs.

Previous studies in the field employ different techniques to understand domestic consumer behavior, and to provide a description of wine consumer profiles; they mainly use psychographic variables, and a qualitative analysis. This article contributes to the field by the definition of a demographic and socioeconomic profile of wine consumers in the U.S. through a quantitative, econometric analysis, probably the first study of its kind.

Interestingly, though, this article contributes to the body of knowledge of wine consumer demographics in relation to wine consumption. American wine consumers have attracted extensive attention from wine retailers and hospitality operators; by investigating their consumer demographic and socioeconomic characteristics, this article provides stakeholders with first-hand information on wine consumption demographic characteristics in the U.S. and helpful insights on how to improve marketing strategies and increase sales. In the context of change in demographics and consequently in consumption patterns in the U.S., it is interesting to study the changes of the demographic and socioeconomic profile of consumers, as it is one of the most important tools within an organization to portray people who consume a product (Martinez and Chang 2007).

One approach to discovering who buys wines in the United States is to develop a profile of the wine consumer by analyzing socioeconomic and demographic data, with the intent of identifying which consumers are more likely to buy wine. This is the case of this article, the first effort to quantify the demographic profile of wine consumers in the United States using U.S. Bureau of the Census data. Most studies attempting to profile wine consumers rely on surveys conducted by the industry, academic researchers, or marketing consulting companies.

This article presents a historical, empirical, and econometric description of American wine consumers' demographic and socioeconomic characteristics within the years 1972 and 2012. It is observed that in the mid-90s there was a change in the American wine consumer profile, moving from a predominantly older individual with higher income and higher level of education; to a consumer with a more younger, more feminine profile, where income or educational level were not significant factors. Wine in the U.S. in the twenty-first century became more popular, more democratic.

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Appendix

Table A1. Variables of the Empirical Model for the three sub-time periods (1972-2012)

Variables	Typology	Description
Wine Consumption (*Dependent Variable, DV*)	Continuous	U.S. Wine Consumption (Total - Liters) **Source.** Wine Institute (2014)
Wine Price	Continuous	U.S. Wine Unit Price per Liter (USD constant 2005 inflation-adjusted) **Source.** Wine Institute (2014)
GDP	Continuous	U.S. Real GDP in Trillions (USD constant 2005 inflation-adjusted) **Source.** Bureau of the Census (2014)
Age	Discrete	1. If the higher rate of variation within the U.S. population is happening between the range of people of 21 to 30 years 2. If the higher rate of variation within the U.S. population is happening between the range of people of 31 to 40 years 3. If the higher rate of variation within the U.S. population is happening between the range of people of 41 to 50 years 4. If the higher rate of variation within the U.S. population is happening between the range of people of 51 to 60 years 5. If the higher rate of variation within the U.S. population is happening between the range of people of 61and more years **Source.** Own calculations following data from the Bureau of the Census (2014)
Gender	Discrete	1. If the higher rate of variation within the U.S. population is masculine 2. If the higher rate of variation within the U.S. population is feminine **Source.** Own calculations following data from the Bureau of the Census (2014)
Race	Discrete	1. If the higher rate of variation within the U.S. population is racially White 2. If the higher rate of variation within the U.S. population is racially Black and/or Hispanic **Source.** Own calculations following data from the Bureau of the Census (2014)
Education	Discrete	1. If the higher rate of variation within the U.S. population is from people with High School education 2. If the higher rate of variation within the U.S. population is from people with University (Bachelor's or higher) education **Source.** own calculations following data from the Bureau of the Census (2014)
Household Income	Continuous	U.S. Average Real Household Income (USD constant 2012 inflation-adjusted). **Source.** Bureau of the Census (2014)
Marital Status	Continuous	U.S. Married Couples (Millions) **Source.** Bureau of the Census (2014)
Beer Consumption	Continuous	U.S. Beer Consumption (Total - Liters) **Source.** Beer Institute (2014)
Beer Price	Continuous	U.S. Beer Unit Price per Liter (USD constant 2005 inflation-adjusted) **Source.** Beer Institute (2014)

Table A2. LR statistic

	LR statistic	Restricted log likelihood	LR statistic chi2	P-value Prob > chi2	SCR
Period 1972-1984					
Model (lhsonly) left-hand-side Box–Cox model	theta = -1	-229.1447	7.14	0.008	
	theta = 0	-227.20531	3.26	0.071	0.05498
	theta = 1	-225.83579	0.52	0.470	5.3e+07
Model (rhsonly) right-hand-side Box–Cox model	lambda = -1	-223.96543	0.09	0.759	4.8e+07
	lambda = 0	-223.93233	0.03	0.867	5.3e+07
	lambda = 1	-223.91845	0.00	0.989	5.3e+07
Model (lambda) both sides Box–Cox model with same parameter	lambda = -1	-229.47848	13.29	0.000	
	lambda = 0	-225.7784	5.89	0.015	
	lambda = 1	-223.91845	2.17	0.141	5.3e+07
Model (theta) both sides Box–Cox model with different parameters	theta=lambda=-1 theta=lambda=0 theta=lambda=1	Could not calculate numerical derivatives - discontinuous region with missing values encountered			
Period 1985-1993					
Model (lhsonly) left-hand-side Box–Cox model	theta = -1 theta = 0 theta = 1	could not calculate numerical derivatives - discontinuous region with missing values encountered			
Model (rhsonly) right-hand-side Box–Cox model	lambda = -1	-169.65811	0.10	0.751	1,23e+16
	lambda = 0	-169.69163	0.17	0.682	1,26e+16
	lambda = 1	-169.78511	0.35	0.552	1,28e+16
Model (lambda) both sides Box–Cox model with same parameter	lambda = -1 lambda = 0 lambda = 1	Could not calculate numerical derivatives - discontinuous region with missing values encountered			
Model (theta) both sides Box–Cox model with different parameters	theta=lambda=-1	-169.09616	0.35	0.554	6,78e-22
	theta=lambda=0	-169.31783	0.79	0.373	0,002954
	theta=lambda=1	-169.78511	1.73	0.189	1,28e+16
Period 1994-2012					
Model (lhsonly) left-hand-side Box–Cox model	theta = -1	-372.48123	0.07	0.790	1.8e-11
	theta = 0	-373.04864	1.21	0.272	.04481
	theta = 1	-375.26817	5.64	0.018	
Model (rhsonly) right-hand-side Box–Cox model	lambda = -1	-376.01193	8.85	0.003	
	lambda = 0	-375.6148	8.06	0.005	
	lambda = 1	-375.26817	7.36	0.007	
Model (lambda) both sides Box–Cox model with same parameter	lambda = -1	-372.97322	0.12	0.729	1.8e-11
	lambda = 0	-373.36933	0.91	0.340	.04557
	lambda = 1	-375.26817	4.71	0.030	
Model (theta) both sides Box–Cox model with different parameters	theta=lambda=-1 theta=lambda=0 theta=lambda=1	Could not calculate numerical derivatives - discontinuous region with missing values encountered			

Table A3. Exponents from the Box-Cox procedure

	Exponent	Coef. Std.	Err.	z	P>z	Log likelihood	SCR
Period 1972-1984							
Model (lhsonly) left-hand-side Box–Cox model	/theta	1.584516	0.7869773	2.01	0.044	-225.57532	1.9e+13
Model (rhsonly) right-hand-side Box–Cox model	/lambda	1.083179	6.115268	0.18	0.859	-223.91835	
Model (lambda) both sides Box–Cox model with same parameter	/lambda	2.128535	.6790899	3.13	0.002	-222.83428	1.6e+17
Model (theta) both sides Box–Cox model with different parameters	/lambda	could not calculate numerical derivatives - discontinuous region with missing values encountered					
	/theta						
Period 1985-1993							
Model (lhsonly) left-hand-side Box–Cox model	/theta	could not calculate numerical derivatives - discontinuous region with missing values encountered					
Model (rhsonly) right-hand-side Box–Cox model	/lambda	-1.665415	4.20e-08	-4.0e+07	0	-169.60792	7.8e+07
Model (lambda) both sides Box–Cox model with same parameter	/lambda	could not calculate numerical derivatives - discontinuous region with missing values encountered					
Model (theta) both sides Box–Cox model with different parameters	/lambda	-.0671596	3.41e-06	-2.0e+04	0	-168.92124	2.6e-11
	/theta	-1.05135	2.28e-07	-4.6e+06	0		
Period 1994-2012							
Model (lhsonly) left-hand-side Box–Cox model	/theta	-.8074698	.6481569	-1.25	0.213	-372.4459	9.4e-10
Model (rhsonly) right-hand-side Box–Cox model	/lambda	18.98895	6.049618	3.14	0.002	-371.58686	
Model (lambda) both sides Box–Cox model with same parameter	/lambda	-.7550119	.7774287	-0.97	0.331	-372.91341	2.8e-09
Model (theta) both sides Box–Cox model with different parameters	/lambda	could not calculate numerical derivatives - discontinuous region with missing values encountered					
	/theta						

Table A4. Model Estimation and Results

	Period 1972-1984	Period 1985-1993	Period 1994-2012
Const	15.6342 (0.671779)***	5.06165e-09 (4.66025e-010)*	-1.28298e-09 (1.44653e-010)***
Race	0.0245376 (0.0190782)	-7.75487e-011 (2.3083e-011)	4.21294e-013 (6.89947e-012)
Education	0.0212466 (0.0307104)	5.87594e-011 (1.34194e-011)*	-3.84081e-013 (9.70879e-012)
Gender	-0.0231891 (0.0161792)	-3.92492e-011 (1.41398e-011)	1.83723e-011 (7.46714e-012)**
Age	0.0287153 (0.0260174)	3.01334e-011 (1.82351e-011)	-1.73288e-011 (4.18801e-012)***
Marital status	0.0859141 (0.0158237) ***	-3.31147e-07 (3.61011e-08)*	1.05674e-07 (1.02017e-08)***
Household income	1.91997e-05 (8.65901e-06)*	0.000100991 (1.86187e-05)*	-4.82821e-06 (7.30785e-06)
Beer consumption	1.51007e-011 (1.17731e-011)	5.28591 (8.46592)	-1.15972 (6.3881)
R-square	0.981507	0.969249	0.970236
Corrected R-square	0.949145	0.753990	0.951295
F(7, 4)	3765.875, p=1.81e-07	5.11e+11 P=1.08e-06	136.2213 P= 8.47e-10
SSR	0.005789	6.78e-22	3.84e-21
Breusch-Godfrey	chi2= 3.349, p= 0.0672	chi2=0, p=1	chi2=0, p=1
RESET Contrast	(squares and cubes) F = 0.698777, p = 0.589 (only squares) F =0,890146, p = 0.415 (only cubes) F =0.893248, p = 0.414	There are not enough degrees of freedom	(squares and cubes) F = 0, p = 1 (only squares) F = 0, p = 1 (only cubes) F = 0, p = 1
Inflation Variance Factor (IVF)	race 1.632 education 2.560 gender 4.019 age 5.591 marital status 9.289 h. income 5.692 beer cons 11.301	race 1.384 education 6.676 gender 6.554 age 10.313 marital status 8.901 h. income 7.745 beer cons. 10.301	race 1.892 education 1.271 gender 1.587 age 2.284 marital status 7.115 h. income 2.929 beer cons. 9.368
Breusch-Pagan Contrast	LM = 5.69681 With p-value = P(Chi-square (7) > 5.69681) = 0.575563	LM = 5.24794 With p-value = P(Chi-square (7) > 5.24794) = 0.629734	LM = 19 With p-value = P(Chi-square (8) > 19) = 0.0148596
Normality of residuals Contrast	Chi-square(2) = 0.0446073 With p-value = 0.977943	Chi-square(2) = 1.049 With p-value = 0.59177	Chi-square(2) = 0.586 With p-value = 0.7461

Note. Within parentheses Typical Deviation of the coefficient estimates

*Denotes significance at the 10-percent level.

**Denotes significance at the 5-percent level.

***Denotes significance at the 1-percent level.

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Exit, Voice, and Loyalty in the Case of Farmer Associations: Decision-Making of Dairy Farmers during the German Milk Conflict

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Abstract

The abolishment of the dairy milk quota, increasing fluctuation of milk prices, and the ongoing structural change in the European milk sector led to the so-called milk conflict. Farmers reacted with protests, membership resignation from the German Farmers' Association and milk delivery strikes. The study analyzes dairy farmers' decision-making under pressure with respect to their association membership and their participation in the strike with a qualitative research approach. Data includes 34 personal, in-depth interviews with farmers and experts. Results show that rising dissatisfaction and exerted pressure by members of the Federal Dairy Farmers Association resulted in decreasing loyalty and voice, and a higher likelihood to exit from the German Farmers' Association.

Keywords: decision making, EVL, grounded theory, milk strike, peer pressure

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Introduction

The German Milk Conflict was an emotionally charged conflict within the dairy industry, between 2007 and 2009. The conflict encompasses a nation-wide movement with its core area in southern Germany. Culmination points of the conflict were two milk delivery strikes, blockades of streets and creameries, as well as public milk obliterations. Relevant factors during the course of the conflict were declining milk prices and increasing price volatility. Furthermore, based on the enacted abolishment of the dairy milk quota in the European Union (EU), planned for April 1st 2015, uncertainty regarding the market development after the deregulation ensued. Many dairy farmers lost confidence in the German Farmers' Association (GFA) representing their interests, and in the agricultural policy on the federal and European levels. During this stage, the Federal Dairy Farmers' Association (FDFA) presented a relatively new option for representing dairy farmers, enabling them to express their frustration concerning their income development and the political developments. The demands of the FDFA were a base price of 43 cent/kg milk compared to a milk price of 34 cent/kg milk in May 2008 (LfL 2008), a raise of the conversion factor (liter to kg from 1.02 to 1.03), a creamery contribution of 5 cents for each kg of milk delivered for marketing purposes, and a more flexible dairy quota system (Top Agrar Online 2008).

The GFA's lack of support for the milk delivery strike caused substantial anger among dairy farmers. As a consequence, a rising number of dairy farmers resigned from the GFA and joined the FDFA. Prior to this development the GFA had been the opinion leader and main representative of German farmers, without any significant competition (Landvolk). The GFA was founded in 1948 and currently represents about 300,000 members. It is the largest and oldest farmer association in Germany (GFA). In contrast, the FDFA was founded in 1998 and reports to represent 30,000 members (FDFA). The FDFA was able to activate and mobilize the majority of its members and could increase membership numbers during the milk conflict.

The study is framed within the broader field of conflict management research, more specifically the topic of decision-making during conflicts. The objective of this study is to analyze the decision-making of affected dairy farmers. In particular, two decisions of the farmers are analyzed, the decision to terminate GFA membership and the decision to participate in the milk delivery strike. The analysis builds on and expands the exit, voice and loyalty theory (EVL) of Hirschman (1970), with the further objective of investigating the applicability of the EVL theory to this case.

Literature Review

Three fields of research are relevant to the analysis, the classical conflict research, research concerning the EVL approach, and research related to cultural characteristics of farmers' behavior in conflict situations. The general conflict literature is diverse, but recent studies place emphasis on factors influencing conflict development and conflict communication. Schwarz (2005:53), for example, identified three different conflict communication levels: rational, emotional, and structural. Concerning important conflict factors, especially trust, solidarity, and personal values are highlighted. Greenberg (2003: 309) emphasizes trust as an extraordinarily important factor. Referring to Simmel, Coser (1972: 39) highlighted that solidarity increases

within the same social stratum. Krysmanski (1971: 128) confirms that social cohesion of a group increases during external conflicts, if shared values and a working group structure exist.

The milk conflict can be analyzed within different theoretical frameworks. One alternative to the chosen EVL framework would be a social movement framework. Benford and Snow (2000: 614) stated that *"[...] collective action frames are action oriented sets of beliefs and meanings that inspire and legitimate the activities and campaigns of a social movement organization (SMO)."* For example, Valdez (2012) investigated farmer protests in Warsaw within social movement theories. The conflict is characterized by multiple commonalities with the milk conflict, especially the economic triggers (i.e., decreasing income and rising market competition). However, the frame leads Valdez (2012) to focus on the formation of a highly mobilized and coordinated group from unorganized actors.

In September 1999, 30,000 farmers and workers protested in the center of Warsaw due to a decade of economic austerity, after the democratization in Poland in 1989 (Valdez 2012: 1). One of the measures to support farmers during this difficult period was the transformation of the large state-run cooperatives into smaller ones to improve the competitiveness of Polish farmers (Valdez 2012: 2). These smaller cooperatives became mobilization networks. Although Valdez (2012: 16) points to activists *"[...] opposing reduced subsidies, low prices, and increased international competition [...],"* she concludes that opportunity and resources were shaping the pattern of protest among the farmers. She determined that *"The restructuring of co-ops helped to solve collective action problems among members, so farmers were more likely to engage in protest [...]"* (Valdez 2012: 17). Accordingly, Valdez's study focused on mobilization and group dynamics whereas the study of the German milk conflict focuses on decision-making on the individual level in the context of peer pressure. Due to the focus on farmers' decision-making during a conflict situation, the EVL-framework seems better suited than the social movement theory, and is used to structure the results.

The basic EVL theory consists of the three factors exit, voice, and loyalty. In a later expansion of the model, neglect was introduced (EVLN model). Exit means withdrawal from an organization or reduced, respectively, missing consumption of a specific product. Voice represents a constructive or destructive feedback about an unsatisfactory condition related to an organization or unsatisfying characteristics of a product (Hirschman, 1970: 4). Loyalty is understood to be the solidarity to an organization, product, or manufacturer and is differentiated into active and passive loyalty. Neglect describes the lack of organizational citizenship behavior or care (Withey and Cooper 1989: 521). Overall Hirschman's model is based on a customer's perspective in the context of products, respectively, employee's perspective towards exit from an organization. In this study, the EVL-model is transferred to associations and their members. Neglect is not included in the analysis, because it does not fit the conflict analyzed. The elements voice and loyalty are evaluated as constructive behaviors while exit and neglect are destructive behaviors. Concerning exit, Grima and Glaymann (2012: 7) mentioned that a withdrawal from an organization can be closely linked to a decline in income, loss of reputation, fear of reprisal, and also emotional outbursts. Cognizant of existing alternatives, employees are more independent, and therefore, the likelihood of exit increases (Grima and Glaymann 2012: 6). Another relevant factor concerning the exit decision is the belief whether performance improvement is likely. In contrast, voice can be seen as an attempt to improve the situation. Typical interactions through

voice can be individual or collective complaints to the management, as well as protests and actions to influence the public opinion (Hirschman 1970: 30). The likelihood of voice increases with loyalty. Hence loyalty can be characterized as a decisive influence on the choice between exit and voice.

For organizations, in particular regarding the recuperation from performance lapses, Hirschman (1970: 24) emphasizes that a mixture of inert as well as alert customers are necessary. Both fulfill an important function, alert customers provide feedback in order to give the organization a chance to adapt, and inert customers are important for the stability of an organization. Inert customers give the company the financial resources to implement the changes and the time to execute the changes. Furthermore, Hirschman (1970: 62-64) also posits a trade-off between profit maximization and discontent-minimization. During a quality change, organizations struggle to assess which group of people or customers will be pleased and which group may be discontent with the changes. The organization should be aware that if a quality change in one direction provokes exits, because discontent members or consumers have an alternative organization, then a quality change in the opposite direction would primarily cause voice of dissatisfied but captive members or consumers (Hirschman 1970: 74). Furthermore Hirschman points to the fact that the situation is complicated by the influence of loyalty (Hirschman, 1970:75).

The third part of the literature review focusses on the cultural characteristics of the actors involved in this conflict insofar as they might differ from actors in other sectors. Fassnacht et al. (2010: 84) mentioned that the agricultural sector is shaped by family businesses, characterized by the co-existence of emotionality, which culturally is attributed to the realm of the family, and rationality, which is attributed to the business realm. Family businesses require multiple roles of the actors involved, which limits the ability to process information and act based on only the factual level. Feindt (2010: 264) discussed that in crisis situations, including structural changes of the market, limited adaptability of farm managers correlates with the termination of many family farms.

Methods

The study is based on a qualitative research approach because of its advantages in exploring social realities. This is due to the possibility to allow multiple perspectives within the research process and to acquire subjective perspectives (Bitsch 2005). The use of qualitative methods can challenge researchers' assumptions about the phenomena examined, and additionally uncover areas of variation, inconsistency, or contradiction (Griffin 2004: 8). Therefore a qualitative research approach offers the possibility of an in-depth analysis of a social phenomenon. In-depth analysis is particularly suitable for this research, dealing with an emotionally charged conflict situation. Furthermore, a major advantage of the qualitative research approach is the *"[…] ability to use the complex variables that are part of […] theory without having to translate them into the one-dimensional indicators that can be processed by statistics"* (Gläser and Laudel 2013: 14). Limitations of qualitative research include the cost of the data collection and analysis and its high time-intensity. Additionally, using qualitative research methods competently requires training and experience (Griffin 2004: 9). Qualitative research also is not suitable to answer

questions regarding the share of particular characteristics or attitudes in a population (Punch 2014: 161).

The research procedure is based on the Grounded Theory concept introduced by Glaser and Strauss (1967). Bitsch (2009: 3) emphasizes that *"[...] although grounded theory is typically framed in the context of discovery and theory development, its usefulness also extends to qualification and correction of existing theory where in-depth understanding of the actors' perspectives is paramount."* Accordingly, this study uses a variant of the Grounded Theory approach, where the aim is not the development of new theory, but the application and, as appropriate, adaptation of existing theory, based on the interaction between theory and data.

According to Bitsch (2005: 77) the grounded theory process can be subdivided in the following recursive steps: deciding on a research problem, framing the research question, data collection, data coding and analysis, and theory development. The process of data collection for developing theory is called theoretical sampling. During this phase the researcher collects, codes, and analyzes data, and decides with respect to which categories of the developing theory, data is not yet sufficient. During the sampling phase, the researcher must ensure the systematic variation of conditions (Bitsch 2005: 79). Thus, the researcher has to determine what data to collect next, based on the overall goal to evolve the theory. Bitsch (2009: 6) mentioned that the aim of theoretical sampling is to provide additional data and therefore fill the gaps of the developing theory. The saturation is expressed by a decreasing number of new codes created and recurring similar quotations toward the analyzed issue. This process controls the amount of data collection deemed necessary (Glaser and Strauss 1967: 45).

The data collection process in this study consisted of reviewing trade magazines and newspaper, as well as in-depth interviews of informants involved in the conflict. All interviews were conducted personally by the first author who also transcribed the interviews. The next step after each interview is the transcription of the audio data. Depending on the type of analysis planned, several transcription techniques are available. In this case, the interview data were transcribed verbatim, only transforming the natural language of the informants, most of whom speak in pronounced local dialects, into more standard German. After the transcription, the next step essential to a grounded theory approach is the conceptual analysis of the data. During this process the interview excerpts are transformed into conceptual categories, and further on become parts of a theoretical framework. After reading the transcripts several times, the researchers start to attach so-called codes to interview excerpts. All codes that remain in the final analysis become part of a code system. During the recursive analysis codes are aggregated to categories and their relationships are analyzed. While coding is broad and open in the beginning, it becomes more specific and selected as the analysis progresses. Therefore, after coding for a category a number of times, the theoretical thinking about the category becomes more pronounced and is requiring researchers' reflection about the category respectively its properties (Bitsch 2009: 6). The codes are the smallest units of analysis. They can be either based on specific theoretical concepts from the literature, such as in the case of this study the EVL theory, or they can be newly developed by the researchers based on what is found in the interview statements and the researchers' overall theoretical knowledge and experience.

In this study, coding was performed with the qualitative data analysis software Atlas.ti 7.0. The software is a tool to support the analysis process through search, retrieve, logic, and other functions, but does not actually replace the repeated reading and coding of all interview transcripts. The software is designed to support systematic development of a code system during the data analysis. However, the researchers must still read each instance of code and compare it to all other instances of the same and similar codes within one interview, as well as all other interviews. This process of "constant comparison" consists of four stages: comparing incidents, integrating categories, delimiting the theory, as well as writing the theory (Glaser and Strauss, 1967: 105-113). It leads to the transformation of interview excerpts, through codes and categories to theoretical concepts and, as in the case of this study, modification of existing theory based on empirical findings und conceptual development. As the analysis progresses, the process moves from natural language of the informant, in which similar perceptions and experiences can be expressed in many different ways, to more abstract concepts, and more general observations and regularities that are the building blocks of theory. Additionally, an important part of the research process are memos, which conceptualize the data in a narrative form (Lempert 2007: 245).

The data collection of this study included a total of 34 interviews with an average length between 1.5 and 2 hours. The interviews were conducted after the milk-strike between January 2011 and January 2013. The focus of the interviews was on the perception of the milk conflict, the decision-making during the milk conflict, and the conflict tactics of the associations involved. The regional focus of the interviews were the German states of Bavaria and Baden-Württemberg, as the main conflict areas. Informants included dairy farmers, agriculture, dairy, and association experts, as well as politicians, and experts of conflict management (see Table 1). Many experts are part-time farmers or have family members who are farmers. The decision rule to distinguish between farmers and association experts is as follows: informants are grouped as dairy farmers, if their association involvement is limited to the rural district. Farmers with statewide or nationwide association activity are grouped as association experts. The theoretical sampling has led to inclusion of regional differences, different farm sizes, and variation in age and membership (GFA, FDFA, or both) within the farmer group. At the time of their respective interview, five farmers were GFA members and five were FDFA members, two were members of both associations. Of the five farmers who were only FDFA members, four had exited the GFA.

Table 1. Overview of Interviewee Groups

Interviewee Groups		**Number (n=34)**
Farmers (dairy)	Farmers, farmer spouses, junior farmers	12
Agriculture Experts	Experts of the agricultural sector, editors in chief	5
Dairy Experts	Dairy market experts and creamery CEO's	4
Association Experts	GFA and FDFA	9
Conflict Experts	Experts of conflict and change management	2
Politicians	Local politicians in agriculture and environment	2

The recruitment of the informants differs for the interviewee groups. Farmers were chosen based on newspaper articles, as well as through suggestions by other farmers and experts, and targeting

the main conflict areas. Experts and politicians were identified through internet search based on their position and field of competence. The conflict experts were recruited through suggestions by other experts. When asking informants for suggestions (snowball sampling), the request was to also name people with a view completely different than their own.

Because of the emotional involvement of many informants in the research topic, the interviews were conducted in an open manner. They were based on a semi-structured interview guide with variants for the different groups of informants (e.g., dairy farmers, association experts, conflict experts, or politicians). Topics included relevant information, such as association membership, farm size, age, and education, as well as viewpoint regarding market regulation. Next, informants were asked to discuss their perception of the dairy conflict (background, pattern, personal position, positioning of GFA and FDFA). Building on their elaboration of the initial situation, the interview was directed toward the opinion formation of the informants during the dairy conflict, strike participation, exit of the GFA, and joining the FDFA. Furthermore, the conflict aftermath, the emotional development was brought up by the interviewer (see interview guide in the Appendix). The full interview transcripts amounted to over 800 pages analyzed during the research process.

Results

Despite additional knowledge of the researchers on the milk conflict and also further information from the scientific literature, trade journals, and newspapers, the results build mainly on the in-depth analysis of the interview transcripts. Explanations based on the results of analyses are illustrated by statements from the interview excerpts. In an effort to improve readability, the natural language of the informants has been corrected for major grammatical errors in the quotes used. The first part of the result section focuses on the decision-making of dairy farmers regarding resignation of GFA membership. In this context it is important to know that *GFA membership* is a short form. Farmers are actually members in local farmer associations, which are then members in the umbrella organization GFA. To further improve readability of the paper, we discuss GFA exit. But farmers do not exit the GFA, they do exit their local farmer association (for example the Bavarian Farmers Association). The second part covers the decision-making concerning participation in the milk strike. In both parts, dairy farmers are differentiated into a convinced group and a pressured group. The convinced group includes dairy farmers who sympathized with the FDFA and therefore were dissatisfied with the GFA. The pressured group includes dairy farmers who felt forced toward an exit or strike decision by FDFA supporters.

Decision-Making of Dairy Farmers Regarding GFA Membership Resignation

The analysis is subdivided into the EVL classification of dairy farmers' actions during the milk strike and influencing factors on the likelihood of exit. Hirschman's (1970) EVL model is transferred to the analyzed conflict in the agricultural sector. The classification serves to structure farmers' actions during the conflict. The different categories of the model were defined according to the context analyzed. Based on the detailed analysis of the interview transcripts, the EVL model has been adapted to the organizational context (farmer associations and their members) and, furthermore, differentiated to better reflect farmers' actions in detail.

EVL Classification of Dairy Farmers during the Milk Strike

Dairy farmers' actions during the milk strike fit well with the EVL model. For the dairy farmers' decision-making, the exit category can be differentiated into three subcategories (Table 2). The first subcategory comprises dairy farmers who resigned their GFA membership due to conviction (convinced exits). Typical for this group is a simultaneous application for a FDFA membership. The lack of support of the GFA for the FDFA requests, dissatisfaction with the GFA and with the economic developments are reasons for their decisions. Additional exit reasons were the lack of identification with the GFA president, at the time, and the upper GFA management in general.

The second exit subcategory comprises dairy farmers who resigned their GFA membership based on pressure (pressured group). In most cases the exit decision of dairy farmers was due to the perceived pressure to participate in FDFA organized membership resignation events or to sign a pre-drafted letter of resignation promoted by the FDFA. Within the pressured group two subgroups can be distinguished, exit under pressure and silent withdrawal from exit. The silent withdrawal represented an attempt of pressured farmers to rejoin the GFA without losing face in the community. Accordingly, the reentry should be undisclosed, so that other community members would not immediately recognize their change of mind. They cancelled their resignations orally contacting responsible GFA officials. This behavior was based on the fear of losing standing in the community, and therefore the withdrawal from exit had to be implemented in silence.

The voice category also consists of three subcategories (Table 2): claimed voice, voluntary voice, and destructive voice. Claimed voice represents the demand for feedback by GFA officials due to the lack of feedback that they had received. Exiting GFA members were approached with a request for feedback from GFA officials. Interviewed association experts reported that many farmers struggled to explain their reasons for the exit. The second voice subcategory, voluntary voice, was most important for the GFA to realize the level of dissatisfaction and to gain insights how to respond to it. During the milk strike, voluntary voice was on a very low level. Reasons for the missing voice were the emotional conflict development, as well as the fear to get visibly personally involved in the conflict. Altogether the milk conflict was dominated by destructive voice explained by dissatisfaction, fear, anger, and emotional upheaval. The destructive voice was exercised mainly by members of the convinced group who often already had become FDFA members.

Loyalty is subdivided into active and passive loyalty (Table 2). In this case, active loyalty includes convinced GFA members, who were supporting the GFA in public and not participating in the milk delivery strike. Altogether, active loyalty was shown by a small group of GFA members, which were a minority during the conflict. Passive loyalty represents dairy farmers who agree with the GFA, but did not support the GFA in public. As a trigger for passive loyalty many interviewees mentioned peer pressure, threats, and the public opinion against the GFA. Loyalty is closely tied to the quantity and quality of voice. The extent of loyalty is often related to the belief in the ability of the GFA to change. Therefore, a close relationship between passive loyalty and decreasing voice could be identified for the farmers interviewed. Overall, the loyalty level of convinced farmers toward the GFA was very low.

Table 2. EVL Decision Making of Dairy Farmers

Categories		Definitions	Statements
Exit	**Convinced Exit**	Resignation of the GFA membership, often linked with joining the FDFA	*"We did not feel represented" (Farmer 12, FDFA)* *"I […] saw a lack of will on the side of the GFA to react […]. They saw no need, they simply said, okay, it will simply happen like that and that's it" (Dairy expert 4).* *"[…] they said, I am disappointed, you betrayed me, I resign" (Association expert 7, GFA).*
	Pressured Exit	Participation in mass membership resignations due to FDFA members' requests and pressure	*"[…] for three weeks they went from house to house in the village, and persuaded people that they should sign [the resignation]" (Farmer 1, GFA).* *"[…] FDFA membership will cost you nothing. How will it cost me nothing? You just take off the 40 € from the GFA, or best you resign there, and have even saved money. That was the argument" (Dairy expert 5).*
	Silent withdrawal from Exit	Exit under pressure and afterwards a silent withdrawal from exit; trying to hide the withdrawal from the community	*"[…] first everyone exited, and in the end everyone is calling and saying, we have signed that too, but we would like to stay a part of it, but no one may know about it" (Farmer 1, GFA).* *"This is really a big issue. So, once they announce, I have now resigned, and then reenter, but you have been the biggest shouter and you have encouraged us, and now you are a traitor or defector […]" (Dairy expert 5).*
Voice	**Claimed Voice**	Feedback demanded by GFA representatives from resigning members who became FDFA members	*"Okay, that is everyone's free choice, but still you are also an active volunteer. You sit down now, and write a letter, and write to me and [the GFA president] what bothers you. [...] You do want to achieve something. So, please write to me what exactly bothers you. Well, then, I got a call a few days later, I should say what concerns us. Because they could not say what exactly was bothering them" (Farmer 1, GFA).*
	Voluntary Voice	Unrequested feedback toward GFA officials concerning the positioning of the GFA or the mood at the member base, with the goal of finding a solution	*"I went to FDFA events frequently, in the beginning. I am now also on the milk committee or in the district for the GFA, because I simply believe that you have to listen to all sides, and if you are not complaining than you can't be heard […]" (Agricultural expert 5 and part-time farmer, FDFA & GFA).*
	Destructive Voice	Unrequested feedback to GFA officials without taking the GFA's perspective into account and with the goal of imposing own opinion	*"He […] read his resignation from the GFA publicly at a meeting. Everyone knows he has worked for years for this association. That means pressure over years" (Association expert 1).* *"The GFA completely missed out on taking the member base with them concerning the milk policy" (Farmer 3, FDFA).* *"The [GFA president] was a very fame-hungry person" (Dairy expert 2).*
Loyalty	**Active Loyalty**	Convinced GFA members, supporting the GFA publicly, not participating in the milk delivery strike	*"Commonality, well, I mean, the GFA as a whole is surely the right institution for us farmers, a good thing" (Farmer 11).*
	Passive Loyalty	Agrees to the GFA's perspective, but based on the public opinion against the GFA does not support publicly	*"I could tell you about villages in the […] region, where nobody dared to say, no, I will not drive to the [FDFA] demonstration. There was a certain group pressure" (Farmer 9, GFA).*

Identified Impact Factors on the Likelihood of Exit

Within the EVL theory decreasing loyalty and lack of voice are indicators of a decision process leading to the exit decision. But in order to get to this state, certain conditions have to be met (Figure 1). As origin for decreasing loyalty, dissatisfaction was mentioned by all interviewees. Especially dairy farmers belonging to the convinced group described mostly the dissatisfaction as a trigger for their decreasing loyalty and the resulting destructive feedback or absence of voice. The overall dissatisfaction with the GFA resulted from dairy farmers' perception of the GFA as an inactive association with respect to market liberalization, especially the abolishment of the dairy milk quota and the increasing milk price volatility. Several farmers claimed to use exit as an implicit voice function to initiate an impulse for development within the GFA.

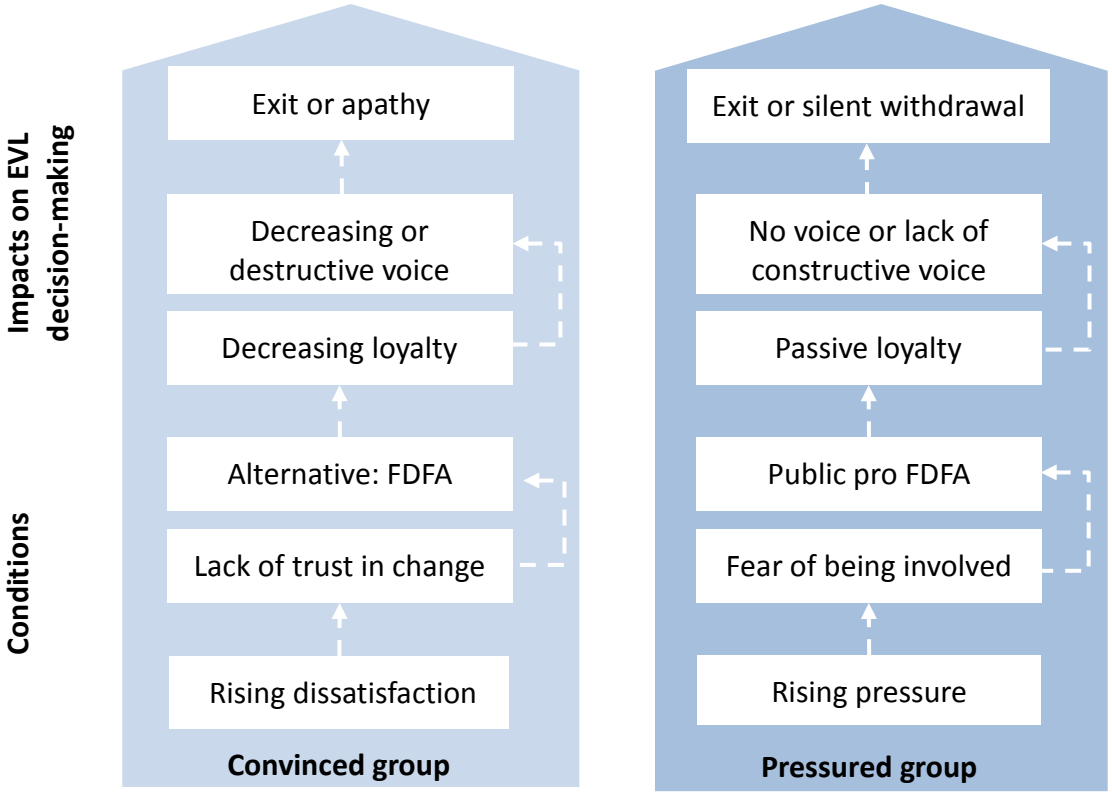

Figure 1. Likelihood of GFA exit differentiated by the convinced and pressured groups

Destructive voice by critical GFA members dominated the further conflict development. To explain destructive voice, the interviewees mentioned the loss of trust in the GFA and its ability to change its strategy toward the support of the FDFA requests. In the beginning, farmers were still convinced that changes in the GFA would occur, and, therefore, tried to foster change through constructive feedback. But with increasing pressure and lack of success, the feedback level decreased or became more destructive.

Loyalty was further decreased by the existence of the FDFA, which was perceived as an alternative to the GFA during the milk conflict. Several of the dairy farmers interviewed joined the FDFA, which often included support of the FDFA vision and an active involvement in the

FDFA activities. Further, the availability of an alternative association in form of the FDFA, specifically representing dairy farmers, is an important impact factor. In a negative cycle the increasing dissatisfaction led to decreasing loyalty and a rising number of passive members. As a consequence, the FDFA swayed the public opinion against the GFA. Again, the quantity of voice decreased or became destructive, resulting in GFA exit or apathy toward the association policy (Figure 1, left side).

For the pressured group the driving factor is not dissatisfaction, but the peer pressure by the convinced group to exit the GFA in order to increase the pressure on the GFA to support their requests. In this context, the fear of many farmers to become personally involved played a major role in their decision-making. Even when they were not convinced to exit the GFA and not dissatisfied with the association's work, they exited to avoid personal consequences. At this point, it is important to know that the public opinion has been against the GFA, and this led to the active loyalty of pressured GFA members to turn into passive loyalty strongly affiliated with missing voice. Finally this led to the exit decision, and in some cases to silent withdrawal from exit (Figure 1, right side).

Decision-Making of Dairy Farmers Regarding Milk Strike Participation

Since the first part of the results explicated the decision process to exit the GFA, the second part focusses on the decision-making concerning a participation in the milk strike. Although both decisions show many similarities, their analysis is separated for theoretical reasons and because the majority of the GFA farmers interviewed dealt with both decisions separately. For many farmers in the convinced group the GFA exit also meant participation in the milk strike, as they mentioned the lack of support from the GFA for the milk strike as one of the main exit reasons. For the pressured group the decision-making process regarding the milk strike took a different form with two potential outcomes. One group of farmers gave in to the pressure and participated in the milk strike, the other group did not participate at all. In this part, the personal perceptions during the conflict and the factors impacting the decision-making, especially emotions, as well as the influence of the family on farmers' decision-making take a more central role than in the first part. The high emotionality and the peer pressure is demonstrated by the fact that of twelve farmers interviewed only two did not participate in the milk strike. Five of the seven GFA farmers interviewed were participating in the strike, a FDFA action. However, as also emphasized by the experts, many of these GFA members only participated one or two days to show their solidarity and decrease the pressure.

Decision-Making of the Convinced Group to Participate in the Strike

Similar to the exit decision process, the dissatisfaction with the price development played an important role in the participation decision of the convinced group. Another reason to participate in the milk strike was curiosity to try strike as a protest form. Furthermore, several of the dairy farmers interviewed stated that they were impressed by FDFA events they participated in. For example, one interviewee explicitly stressed the process dynamic as following:

"There has been an incredible group dynamic; and the group dynamic was uncanny. So, in some villages, not all, there were participants who are saying that it was the best time of their lives. This also happens, because one has met every day at someone's home, cooked together, and looked up the latest news on the internet. Being mean, one could say, that is a cult; that was similar to a cult" (Farmer 1, GFA).

Their own genuineness was mentioned repeatedly by dairy farmers as an important personal motivation to participate in the milk strike, especially if they were FDFA members. They wanted to act as role models for undecided farmers and thereby support the FDFA. In addition, the participation in the milk strike provided an opportunity to the dairy farmers of the convinced group to see what they could achieve together. Hence, several farmers explained their decision for the milk strike as an investment in the future.

"The other thing is, one has to know, as I already mentioned, which opportunities are there, and what the limits are. What has been really important for the milk strike was to palpate how the creameries react. That was very important, and also how politicians react, and how the consumer reacts" (Farmer 8, GFA).

The quotes also indicate that the broader objectives of convinced dairy farmers were to gain public attention and increase pressure on politicians. Farmers wanted to emphasize their own position of power as milk producers in the dairy value chain. Overall, the decision-making was influenced by a wide variety of emotions due to farmers' high emotional involvement in the conflict.

Table 3 provides an overview of the perceptions of farmers in the convinced group. The table illustrates the emotional issues during the conflict development and important factors impacting the decision-making process. For the convinced group, predominant perceptions were positive, such as enthusiastic or powerful. This reflects the positive perception of the majority of farmers in the convinced group regarding the conflict atmosphere. But besides the positive perceptions, negative perceptions, such as fear about distortion of competition or loss of face, were also present.

Table 3. Convinced Farmers' Perceptions Regarding the Decision Process to Participate in the Strike

Perception	Definition	Statements
Curious	Gain knowledge about the effects of a milk strike, gauge the reactions of important players	*"[…] we would still debate the strike around and around. And now everyone knows clearly, this can be achieved and not achieved [by a milk strike] and then it is easier to gauge" (Farmer 8, GFA).*
Enthusiastic	Being part of the group and of the extraordinary development within the community	*"It was exciting. There was incredible solidarity. […] how it forged people together, young, old, seniors" (association expert 1). "[…] everyone was on our side […]" (Farmer 4, FDFA).*
Powerful	Feeling of power, taking an active role	*"It was indeed amazing, and above all, not to be defenseless any more, but to demonstrate to the creamery it could be different" (Farmer 8, GFA).*
Genuine	Avoiding loss of face, keep one's standing in front of others	*"I can't say, I will continue to milk; […] I would be cease to be credible, beyond recovery" (Farmer 4, FDFA).*
Sense of justice	Fear about distortion of competition, eager for high participation in the community	*"I was very glad that our direct neighbor participated, simply to eliminate a certain distortion of the competition […]" (Farmer 10, FDFA & GFA).*

Decision-Making of the Pressured Group to Participate in the Strike

The farmers in the pressured group either took part in the milk strike under pressure fulltime or at least part of the time. The pressure exercised included strike control, threats of terminating business relationships, and disputes within families. Dairy farmers of this group who participated felt they gave in to peer pressure. They reported, for example, verbal abuse, hate mail, threats, strike control through following of milk collection trucks, and the termination of supply relationships. As a result, several farmers participated in the end phase of the milk delivery strike:

"There was indeed a certain pull, a certain pull effect was definitely part of it, and then for many that had a hard time deciding, they thought then, yeah well, if I do not participate now, then I will be left standing alone, and, therefore, I participate too" (Farmer 7, FDFA).

Many farmers of the pressured group described emotional distress. They felt forced by convinced FDFA members toward a decision to participate in the milk strike, as this statement from one of the experts illustrates:

"There was pressure exercised on people, also as mass pressure, […] and there was this black-and-white theme; you can only be for us or against us, and there is nothing in-between. [...] and this group pressure, I have experienced as really devastating" (Conflict expert 1).

In addition to the pressure by FDFA supporters, other groups also exerted pressure on farmers' decision-making process. The pressure in the communities resulted in discussions within the wider families of the farmers.

"Within the family, the pressure was rather high, from relatives too, and former farm managers. *[…] other family members […], they even said, they pay the milk money to me, just to, well, protect the [family] name"* (Farmer 5, GFA).

As actions to influence and convince dairy farmers to participate in the strike, in particular, continuous threats were reported. Threatening actions included break-ins with opening of milk containers by other farmers, traitor slogans sprayed on houses, and illegal drugs left on milk containers. GFA officials described threats of mass membership resignations, if they would not participate personally in the milk strike. Due to the increasing pressure many farmers in this group felt forced into actions to protect themselves, which included the participation in the milk strike.

Altogether, farmers in the pressured group named a wide variety of perceptions concerning their decision-making. A recurring perception was the wish to demonstrate solidarity, which was closely connected to the personal goal of preserving their standing within the community. Further perceptions triggered by the pressure exercised from FDFA members were fear and an inability to cope with the situation. Many GFA farmers were concerned to lose their standing in the community or with other farmers, if they did not participate in the milk strike. They were afraid of endangering long-term relationships with other farmers, and were torn between family conflicts concerning their participation. A conflict between the older and the younger generation

was quoted by the older generation. Many of them were against the milk strike, and mainly against the destruction of food. Their main arguments were based on their personal experiences during the war and periods of food shortage. Typically the younger generation was more enthusiastic about the milk strike as a more radical protest form compared to banners or demonstrations. A majority of informants described negative perceptions with respect to the pressured group, such as threatened or controlled. Table 4 provides an overview of the perceptions that were reported repeatedly as reasons to temporarily participate in the milk strike under pressure.

Table 4. Pressured farmers' perceptions regarding the decision process to participate in the strike

Perception	Definition	Statements
Solidary	Wish to demonstrate solidarity	*"And then, naturally, there has been a large share that were not members of the FDFA. They participated then out of solidarity. This group was not very small, but rather many. […] Those who participated out of solidarity, they say now, once and never again" (Farmer 10, FDFA & GFA).*
Afraid	Unable to cope with the pressure, overwhelmed by the situation	*"[…] it was the worst time I have ever experienced in my life. […] and then I had a couple of calls, which were less great, from female farmers who were crying on the phone said they were threatened […]" (Farmer 1, GFA).*
Threatened	Felt threatened due to not participating in the milk strike	*"[…] they threatened children in school, if one did not participate in the boycott. […] My colleague [name] who worked here at the time, he had received a death threat by a FDFA radical" (Association Expert 4).*
Controlled	Strike posts controlling where the milk truck picked up milk	*"And so, I followed the milk truck, and said, come on, it is milk strike, we are doing it together. And everybody stuck to it" (Farmer 12, FDFA).*
Concerned	Concerned about avoiding loss of one's standing in the community	*"In the village, you are going to live your life. For what I should fight against each other, or for what should I be at war with one another; that achieves nothing" (Farmer 4, FDFA). "If you lose reputation, that is the older one is, the more difficult it is afterwards" (Dairy Expert 5).*
Anxious	Anxious to maintain relationships with customers and business partners	*"[…] I will pour the milk as well for two days, because, I do not want to completely mess up the relationship with my neighbor […]" (Dairy Expert 5).* *"I know someone […] who claimed that for someone who is not participating, he does not work anymore" (Association Expert 1).*
Torn between	Conflicts within families, between generations	*"There were indeed families with intense disputes, between husband and wife, but even more between the older and the younger generation" (Farmer 1, GFA).*

Decision-Making of the Pressured Group to not Participate in the Strike

The pressured group also includes a subgroup of farmers who did not participate in the milk strike despite the pressure. According the informants interviewed, the major reasons to not participate in the milk strike were economic and ethical reasons and also the overall belief that the strike will not be successful, respectively is not meaningful. Economic reasons to not participate in the milk strike were a disagreement with the FDFA demands and a management

focus on farm growth. According to the informants, farmers of this group hesitated to breach the contract with their creameries. Especially with respect to the second milk strike, several interviewees specified that based on their experience of frustration during the first strike, they did not want to participate a second time.

"[…] if I have an existing contract, this contract exists between two contractual partners […], and then, well, essentially I cannot breach the contract" (Farmer 6, GFA).

"I will not strike against my own enterprise [Cooperative Creameries]" (Policy Expert 1, referring to the decision-making on the dairy farm of her husband).

For several dairy farmers, their financial situation did not allow the participation in the milk strike. Because of bank loans, they felt they needed the money from the milk delivery and strike participation was not an option.

"They simply could not afford it due to financial reasons […]" (Association Expert 1).

In addition to the economic reasons, ethical reasons played a role in the decision to not participate in the milk strike. Specifically, farmers mentioned their reluctance to destroy food.

"Well, the pouring of milk that is a big challenge for many" (Association Expert 1).

"[…] you can imagine, if one does the work, and then one is opening the milk-tap and has to watch. That simply hurts the heart. There goes the daily work. One has to emotionally bear this. And second, financially one has to also bear it. That are several 100 € for a larger dairy farm, every day" (Farmer 9, GFA).

Another group of non-participating farmers were convinced that the milk strike would not be successful, hence from their point of view a participation made no sense.

"[…] and if one says this cannot work, from my perspective, then one has to distance oneself" (Farmer 5, GFA).

Discussion

Starting with the exit decision with respect to the GFA, the discussion section recollects the main findings of the preceding analysis and contrasts them with the research literature, as well as the EVL theory. The exit decision is also put into the context of the decision to join the FDFA. Furthermore, the strike participation decision, which seems to have been even more emotionalized and subject to peer pressure than the exit decision, is discussed in the context of the GFA policy.

Characteristic of the convinced group was the GFA exit, which was often linked to joining the FDFA and participation in the milk delivery strike. Some members of the convinced group perceived their exit as implicit voice to make the GFA aware of their dissatisfaction regarding the lack of cooperation with the FDFA. Overall, voice in form of feedback was missing or

mainly destructive. Even when GFA officials made an effort to claim feedback from resigning members concerning their exit reasons, they were ignored or not answered in a constructive manner. At the time, GFA attempts to win back former members often failed or provoked resistance. Thus, destructive voice from the convinced group dominated the feedback to the GFA. The level of loyalty from the convinced group towards the GFA was low, due to the decreasing belief that the GFA would support the FDFA and its requests (e.g., minimum price, flexible quota system).

The perceived options for farmers of the pressured group regarding GFA exit included pressured exit and silent withdrawal from exit. These two groups rarely showed any voice function, and their loyalty to the GFA was not displayed in public. They hesitated to publicly commit themselves to the position of the GFA towards the milk quota and the milk delivery strike. The pressured farmers reduced feedback due to social reasons, such as preserving reputation, justifying themselves in the local community, and the perceived peer pressure. They also strived to maintain relationships with FDFA farmers.

The passive loyalty and missing voice are closely related. Passive loyalty reinforced the lack of voice and led to even more passive loyalty. The reasons lay in a fear of becoming visibly personally involved in the conflict, the pressure exercised, and the public opinion against the GFA. Furthermore, within farm families the interaction between emotionality and rationality is important to understand the situation. During the conflict the family decision-making was subject of intensive discussions, especially concerning the possible effects on the standing of everyone in the family within the community. Often farmers had to weigh their own standpoint against harmony within the family, with the other generation (predecessors or successors), and among business partners. This balancing act was reflected in actions of pressured farmers to silently withdraw from the GFA exit, decrease their public voice, or participate temporarily in the strike.

Regarding the strike participation, perceptions analyzed differed critically between the convinced group and the pressured group. The differences between perceptions reflect the differences in the decision-making processes. In the convinced group, positive perceptions dominated (e.g., curious, enthusiastic, powerful). The decision-making of the pressured group was marked by negative perceptions (e.g., threatened, controlled, concerned). These perceptions resulted from the impact of actions by FDFA members, including threats, visits, and strike controls. The impact level depended on the personality of the farmer and the personal, emotional environment.

Within this study two major decision-making processes were considered: the decision to exit the GFA and the decision to participate in the milk strike. These two decision processes were considered separately, but there are parallels between both. For the convinced group, the exit decision was typically linked with the strike decision, because the strike was a key request of the FDFA and not supported by the GFA, which in turn was one major reason for leaving the GFA. The pressured group felt coerced to leave the GFA and to participate in the milk strike. Exit from the GFA was not always linked with joining the FDFA, even for the convinced group, but the majority of exiting farmers joined the FDFA.

Based on the analysis of the interviews conducted, four options regarding association membership were realized, two options involving GFA exit, (i) exiting without joining the FDFA

and (ii) exiting and then joining the FDFA, and two options without GFA exit, (iii) not exiting but still joining the FDFA and (iv) not exiting and not joining the FDFA. According to the informants, the most commonly realized option was (ii) exiting and then joining the FDFA. This study focused on the exit decision and not on the decision to join the FDFA. However, the results lead to the proposition that some exit reasons are also important entry reasons. Common reasons were the strong appeal of the FDFA vision and demands, as well as the fear of change. Furthermore, existential problems related to the abolishment of the dairy milk quota were relevant in both decisions. The abolishment was supported by the GFA, whereas the FDFA promised to fight for a preservation of the quota. Regarding the strike participation, it is remarkable that many GFA members participated in the milk strike. The inhibition threshold to participate in the strike seems considerably lower than to exit the GFA. Possibly the pressure concerning the strike decision was more potent and direct.

In this context, data on the actual scope of membership loss would be interesting, but is difficult to estimate. The GFA did not publish official numbers concerning the membership loss during the milk conflict. Experts assess that the nationwide loss of members was not dramatic; but regional impacts, including the exit of whole local committees, were definitely considerable. Informants believe that a majority of former members came back to the GFA. Meanwhile the FDFA has lost influence, despite the current re-ignition of the milk price debate. The disillusioning results of the two milk strikes led to passive and frustrated FDFA members who were resigning their memberships. Except if the prices were to drastically drop again, it would be difficult for the FDFA to recover. The FDFA seems to have ceased to be considered a viable alternative for many dairy farmers. Since the end of the milk conflict the development of the milk market is characterized by ongoing structural changes, milk price fluctuation, and overall decreasing milk prices.

Several results of prior studies were reaffirmed by the results of this research. Feindt's (2010) description of farmers' behavior in crisis situations (e.g., transfer of responsibility, blaming) were also identified in the convinced group's decision-making. The farmers held politicians and GFA officials accountable for their uncertain future prospects. Coser (1972) mentioned higher participation rates in small group actions, which could be an explanation for the extraordinary high engagement of FDFA members during the milk conflict. Besides, group affiliation and trust were identified as foremost reasons for the high involvement of FDFA members. They could personally identify themselves with the FDFA demands. Valdez (2012) reported activists stating income loss and similar concerns as motivations to protest, but not as the main basis for the ability to organize. The current study also points to economic concerns as the initial impetus. But similar to Valdez's group dynamics and structural reorganization of cooperatives, this study finds peer pressure and the availability of an alternative association as important factors in farmers' decision-making processes during the milk conflict.

Hirschman emphasized in the EVL theory the importance of a balanced mixture of inert and alert customers for an organization. The analysis of the milk conflict showed that the mixture was not balanced in the case of the GFA. The GFA was struggling with a rising amount of alert members, and therefore was strained to change. Another aspect of Hirschman's theory relevant for this study is the description of organizational decision-making in order to estimate the impact of quality change on different groups of members or customers. This parallels the dilemma of the

GFA concerning the positioning during the milk conflict on three major issues, whether to oppose the abolishment of the dairy milk quota, to support the FDFA demands (e.g., minimum milk price), and to support the milk delivery strike. For all three aspects, the membership base was divided. Initially, the GFA had decided to not become active regarding any of the three issues. However, during the milk strike, parts of the GFA supported it temporary due to high personal pressure. The GFA policies affected the decision-making of the dairy farmers extensively, and split farmers into two groups, the convinced group and the pressured group, and more generally FDFA supporters and non FDFA supporters.

The GFA management was faced with the challenge to position the GFA towards the critical issues stated above. Regarding the abolishment of the dairy milk quota, the association supported the already enacted measure, knowing that the decision would cause dissatisfaction, especially among small-scale dairy farmer. The dissatisfaction in combination with the possibility of an alternative association, the FDFA as supporter of the milk quota, has contributed to the increasing number of exits. The strategy of the GFA was oriented towards the long-term, despite the awareness of possible short-term repercussions. The strategy came with the disadvantage of not being able to prevent temporary exits and deescalate the conflict at an early stage.

Grima and Glayman (2012) described a rising likelihood of exit based on a decline in income, as well as the existence of alternatives. Interviewed farmers mentioned as most important exit reasons the existence of the FDFA, as well as the disappointment with the milk price and, hence, the negative income development. Kolarska and Howard (1980) emphasized the relationship between the likelihood of exit and the belief in performance improvement. Parallels can be seen in the quantity and quality of voice of the convinced group. They started with constructive feedback and clear demands, but with the insight that the GFA would not fulfill their demands, dairy farmers of the convinced group changed to destructive feedback and exited the GFA.

In Hirschman's fundamental work developing the EVL theory, he related exit to the economic sector and voice to the political sector. Based on this study, the dichotomy suggested by Hirschman should be called into question. Based on this study, the limitation of the exit category to the economic sector limits the applicability of the theory unnecessarily. Exit as part of the EVL theory helps to explain the decline in association membership by describing the outcome of a decision-making process, as the analysis shows. Similarly, voice, which is indispensable for political actors and also for production companies with respect to their customers, becomes increasingly important, promoted by the social media environment. Evidently, voice is also a critical factor for organizational development processes, and a major factor in conflict prevention within organizations.

Conclusions

The study was based on Hirschman's (1970) EVL theory, which initially focused on consumers' decision-making with respect to companies and their products. Within this study the model is transferred to the agricultural sector, and applied to associations and the decision-making of their members. The study analyzes farmers' decision-making during the highly emotionalized milk conflict, including farmers' developing perceptions. These perceptions were identified and discussed in the context of how different groups of farmers (convinced, pressured) were affected

differently. With regard to the exit decision of dairy farmers to resign their GFA membership, the exit category of the EVL theory was modified. The differentiated exit category consists of convinced exit and pressured exit, and the additional element of silent withdrawal from exit. The voice category also was differentiated into the subcategories of voluntary voice, claimed voice, and missing voice. The loyalty category remained unchanged compared to the basic EVL theory.

The study's aim was not to focus on conflict patterns and conflict management, but to provide a deeper insight into the decision-making of dairy farmers in conflict situations and in the context of peer pressure. Overall, it can be ascertained that the decision-making of GFA members during the conflict was influenced by peer pressure and by decreasing loyalty (or a change from active to passive loyalty), when personal disadvantages occurred. The personal situation had a higher priority than to support the GFA and show active loyalty. The FDFA was able to use peer pressure and the passive loyalty towards the GFA in their measures to influence the decision-making, especially in the case of undecided dairy farmers. The FDFA actions affected first the loyalty levels, and then also the exercise of voice. Several informants compared the emotionalization of the FDFA movement during the height of the milk conflict to the historical period of the Third Reich in Germany. Some informants went even further with the analogy. The analogy symbolizes the high emotional charge during the conflict, and the aspects of peer pressure as central to farmers' decision-making.

Associations and other membership based organizations may learn from the following aspects of the conflict analyzed. Communication is essential for achieving active loyalty and to motivate members to improve the organization through active voice. Possibly, a change from a top-down communication approach to a more base-oriented approach can help with managing member communications. Even, in professional organizations, the management must not underestimate the importance of an emotional appeal to the member base.

As Fassnacht et al. (2010) point out, the agricultural sector is characterized by family businesses, which results in the co-existence of emotionality and rationality. The insights gained from farmers' perceptions can serve as guidance for representatives and management to improve their understanding of farmers' decision-making under pressure. Based on the findings, addressing fear and other emotions could be improved by offering more options for members to exchange their opinions and discuss different perspectives. For example, more workshops and other opportunities for exchange through joint activities with the members can serve trust and relationship building, as well as improve the discovery of early warning signs of upcoming crises. The introduction of internal voting polls or working groups on current topics could be a variant to achieve a broader consents and commitment concerning controversial points and to identify upcoming issues.

Overall, communication with the member base should take a broad approach, including info mailings, chats, online blogs, and own video clips to speed up the communication process. An opportunity for further exchange can be provided by more extensively using the existing online communication platforms for member discussions. The goal of this approach is a shift from passive members to more actively involved members, which can have a positive effect on loyalty levels. In that case, at least one association representative must be the responsible contact partner

and monitor the discussion closely. This type of involvement requires training in online communication and a considerable amount of resources.

Furthermore, associations or other organizations should train authorized personal as conflict experts for specific topics or generally in conflict management, in order to be better prepared for conflict situations. Another effect would be the opportunity of identifying potential conflict issues early, in the initiation phase, when a factual discussion is still possible and interventions to decrease exit and destructive voice are more likely to succeed. Different strategies could be prepared in advance and upcoming changes in important policy regulations could be assessed in a timely manner. Based on the modified EVL theory, it can be useful for organizations to structure the feedback received based on the subcategories during different stages of a conflict or dispute in order to get a better overview of the development of the situation. Building on this knowledge actions can be initiated, for example, an official statement or convening an extraordinary general meeting. This systematic approach would help to structure the conflict response, and provide insights in the members' behavior, as well as possible consequences.

The milk conflict offers many opportunities for research, and therefore not every aspect could be covered in detail. Further analysis, for example concerning the market channels of striking farmers (cooperative or privately owned creamery) would add an additional perspective concerning the decision-making and possible impact of the membership in a cooperative creamery. Several experts interviewed emphasized the emotionality of the conflict and the irrational action of farmers to strike against their own cooperative. Based on the detailed analysis of the data collected in this study, the majority of farmers interviewed mentioned that they were not primarily focusing on their creamery, whether cooperatively owned or otherwise. They emphasized to have the bigger picture in mind, which included to increase pressure on politicians and gain media attention through empty supermarket shelfs. Another interesting aspect mentioned by many informants was that the GFA, and especially the president at the time, as the highest representative of the umbrella organization impacted the decision-making of farmers in the state associations, despite in some cases different approaches by the presidents on state levels. Overall, the presidents of both the GFA and the FDFA played a major role during the conflict.

Future research can build on the explicated broader range of subcategories of exit and voice in order to develop measurement models. Furthermore, the developed differentiation into subcategories is a suitable starting point to compare the exit decision among different groups, including consumers, association members, and others, to identify commonalities and differences. Further research could analyze parallels between this and other conflicts in the agribusiness sector in order to estimate to which extent, and how the lessons drawn from this conflict can be applied to other conflicts. The comparison could result in more general theory development. There are several historical and recent conflicts in the agribusiness sector to explore in more detail, and potentially suitable for a comparison, including the recent Brazilian trucking conflict and the port slowdown in the western U.S. by the dockworker union. As is typical for qualitative research, a further comparison would exceed the in-depth analysis provided in this study. In general, qualitative studies offer lessons learned to their readers, but results are not generalizable to other populations or instances of the phenomenon researched. However, qualitative research contributes to theory development, which is then available to

future research, as well as to managers and other actors in the field to choose to apply. Different from quantitative research, in qualitative research the decision whether the extent of similarity between sending and receiving context warrants transferability to the new context shifts to the potentials user (Bitsch 2005: 85).

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Appendix. Interview Guide (Farmers)

Relevant interviewee information

- Farm size and structure, overall structure in the region
- Age, education, volunteer respectively political involvement
- Membership in the GFA / FDFA and other organizations

Perception of the dairy conflict

- Trigger factors and initial conflict signs
- Conflict pattern and possible causes for this conflict
- Level of dissatisfaction and fear of change
- Role of GFA and FDFA within this conflict
- Personal standpoint towards the dairy conflict
- Important involved persons

Opinion formation towards a participation in the milk strike

- Development steps of the decision to participate / not participate in the milk strike
- Causes and influencing factors
- Own opinion towards the results of the dairy conflict
- Own insights and terminations based on the milk strike
- Decision-making within the own family
- Participation in a future dairy conflict
- Impact on the opinion formation, opinion leader

Exit and conflict aftermath

- Relationship towards farmer colleagues, neighbors
- Estimation of the development within the association structure
- Exit and reentry (reasons, motivation, obstacles)

Association structure

- Expectations of the associations
- Optional measurements to deescalate the conflict
- Reasons for an association exit respectively moving away from someone
- Dealing with emotions of the two involved associations
- Recognized reactions and changes from the GFA and FDFA
- Communalities between both, wish for changes, image

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Assessing Cash Holdings in Agribusiness

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Abstract

By using fixed-effects panel regression, we model cash holdings for agribusiness firms during the 1970-2012 period. The results suggest that agribusiness firms manage cash in a manner consistent with the precautionary theory of caution management. Specifically, agribusiness firms hold cash to quickly execute growth opportunities and limit transaction costs of acquiring capital for growth. Furthermore, a subset of cash-rich agribusiness firms, which concentrates 78.5% of the aggregate cash and 49% of total revenues, is analyzed with a logit model. Results of cash-rich agribusiness deviate from predictions by the precautionary theory. This finding has potential implications for structural changes in this sector.

Keywords: optimal cash, precautionary theory, agency theory, US agribusiness

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Introduction

Many agribusiness firms held large amounts of cash relative to total assets recently. These firms recorded strong operating performance during the profitable agricultural production years, and banked some additional cash in reserve. Given that cash holdings typically generate immediate returns below firms' weighted average costs of capital, one might assume that the firms would have quickly redeployed the cash into other assets or returned the earnings to shareholders.

For example, Deere & Co held cash at elevated levels relative to total assets from 2009 through 2012 as compared to historical cash holdings. As the US farm economy has slowed, Deere & Co cash levels are closer to historically normal benchmarks. One reason for holding cash is to preserve liquidity, which can expedite investment in growth and acquisition opportunities. Another reason to hold cash is to prepare for less robust operating periods. Alternatively, managers of the firm might choose to hold cash to insulate themselves from the demands of the capital markets. Finally, perhaps management of a firm is risk averse and chooses to hold cash to manage risk.

One particularly relevant consideration for agribusiness firms is the consolidation among certain parts of the food and agricultural value chain. Consolidation has led to a declining number of actors in the agrichemicals, seeds, and fertilizer industries. There are also only a few farm equipment manufacturers left. The slowdown in the US farm economy might accelerate a wave of consolidation among others parts of the value chain. Retail appears particularly ripe for such activity. Retail supply firms have begun to acquire neighboring locations to drive sales growth and profitability. Firms executing this strategy will require cash to do so. Management at many such firms may opt to hold cash at elevated levels to make acquisition faster and cheaper.

The goal of this paper is to assess the financial positions of agribusiness firms to understand the reasons for holding cash. The results suggest that agribusiness firms manage cash in a manner consistent with the precautionary theory of caution management. Specifically, agribusiness firms hold cash to quickly execute growth opportunities and limit transaction costs of acquiring capital for growth. The results also suggest a deviation from the predictions by the precautionary theory when a subset of cash-rich agribusiness is analyzed.

Determinants of Cash and Literature Review

Harford (1999) and Opler et al. (1999) revive the cash literature, which currently relies on the precautionary theory mainly. Previous to these studies, the "…literature of cash reserves [was] … either descriptive or concerned with corporate transaction demand of cash" (Harford 1999, p. 1969). The transaction demand of cash theory, by Keynes (1936) and Miller and Orr (1966), focuses on transaction costs incurred by firms when converting noncash assets into cash. Firm size is the proxy to test this theory since economies of scale existed in transaction costs; small firms held higher cash as a percentage of total assets.

According to the precautionary theory, firms accumulate cash to cope with adverse shocks when access to capital markets is foreseen as more uncertain and costly. Opler et al. (1999, p.10) state: "…cash shortfall will prevent a firm to undertake profitable investments if it does not have liquid

assets. Thus, a firm will find it profitable to hold cash in order to mitigate the cost of financial distress." Under this theory, firm size, growth opportunities, the magnitude of cash flows, and cash flow volatility are the main determinants of cash levels in firms' balance sheets. The theory predicts that the level of cash has an inverse relationship with firm size and cash flow, and a positive relationship with growth opportunities and cash flow volatility. Empirical models add control variables to explain optimal cash.

On firm size, small firms could find high cash holdings more valuable as the access to credit is more limited (Opler et al. 1999, Sanchez and Yurdagul 2013). Firms with higher growth opportunities would retain cash to internally fund investments partially or totally without the need to seek external financing, which may be costly or unavailable (Cole 2014). Market value to book value (MTB) is widely used to proxy growth options. High MTB firms have growth options embedded in their current values (Opler et al. 1999) and derive most of their values from growth opportunities and intangibles such as human capital and research opportunities (Smith and Watts 1992 and Bizjak et al. 1993, cited in Harford 1999). John (1993) first documented that firms with higher MTB tend to hold more cash to avoid an underinvestment problem.

Regarding the magnitude of cash flows, firms generating higher level of cash flows (before investments) would keep lower cash reserves as they can replenish their holdings more quickly (Pinkowitz et al. 2013) when investment opportunities arise. The volatility of cash flows is perhaps more important than the level of cash flows in the precautionary theory framework. Firms with more volatile cash flows would hold higher cash for the uncertain future. Harford (1999) and Bates et al. (2009) find the increase in industry cash flow risk to be the one of the main causes of the recent increase of cash holdings in the US.

Empirical optimal cash models use the precautionary framework as a baseline. The model by Bates et al. (2009) is an extension of Opler et al. (1999). The model is currently widely used because it explains most of the variation of cash across firms. These results held even in the middle of the secular increase of cash holdings for the aggregate US firms during the last two decades. However, Bates et al. (2009) recognize that substantial cross sectional variation across industries is not explained by the model. They also recognize that the literature has not made enough progress to provide a dominant model for cash holdings. In this study, we use a model similar in Bates et al. (2009) with a minor extension; we include firms with foreign taxes as control variable since most recent research has found that some firms may have cash trapped overseas for tax reasons (Foley et al. 2007, cited in Dittmar and Duchin 2012; Cole 2014).

While most empirical studies support the precaution theory, deviations from its predictions have opened alternative hypotheses to explain cash, especially *high* levels of cash. The free cash flow hypothesis by Jensen and Meckling (1976) and Jensen (1986), built on the agency problem between managers and stockholders, is one of them. Under this hypothesis, managers abuse the freedom that excess cash could provide, as cash may insulate them from the discipline of capital markets. The prediction by this hypothesis is that managers in firms with large free cash flows and low growth opportunities are likely to hoard cash for their personal benefit or to invest it in value destroying projects.

Harford's (1999) findings support the free cash flow hypothesis for American firms. The author models optimal cash holdings under the precautionary framework, estimate deviations from expected cash levels, and analyze spending behavior of cash-rich firms, those with the highest deviations from the model. Cash-rich firms, the author concludes, are more likely to make acquisitions, and those acquisitions are value decreasing because they are mainly diversifying acquisitions and because the acquired firms are less likely to attract other bidders. The results on the free cash flow hypothesis, however, are inconclusive due probably to the following reasons.

First, the methodology is sensitive to the optimal model of cash holdings employed. By the time the study by Harford (1999) was published, no consensus on a robust cash model existed; in fact, the model in Harford (1999) did not control for variables that have been shown to explain cash holdings.[1] Second, the study covers a period (i.e., 1972 to 1994) when cash holdings had not experienced dramatic increases in the US. Finally, other studies have documented results inconsistent with the free cash flow hypothesis. For instance, Opler et al. (1999), using additional control variables, find little evidence that being a cash-rich firm has impact on acquisitions and capital expenditures. In particular, firms with high cash spend only slightly more on new projects and acquisitions than the rest of firms. They find that some firms accumulate cash for precautionary motives to cover operating losses, not for the personal benefit of managers. Bates et al. (2009, p. 1998) conclude that: "…overall, the evidence is inconsistent with the notion that the increase in cash holdings over time can be systematically ascribed to agency problems in firms." Furthermore, Harford et al. (2008) show that poorly-governed firms tend to have lower cash ratios, and Dittmar and Duchin (2012) test several empirical proxies of corporate governance and confirm that agency problems do not explain why a firm is cash-rich.

Another hypothesis to explain cash-rich firms is a behavioral explanation provided by Dittmar and Duchin (2012). After showing that cash-rich firms have less incentive to hold cash for precautionary reasons, and finding no support for the free cash flow hypothesis, they claim that managers in cash-rich firms are overly conservative and have a propensity to hold more cash than needed, thus decreasing the market value of cash, as perceived by investors.

As is standard in the current literature, we follow the precautionary theory framework to model cash for agribusiness. Consistent with previous studies for the US market, we find overall support for this theory in agribusiness firms. Some empirical deviations from the precautionary theory and implications of the results are discussed. We provide the models in the next section and describe the sample.

In addition to the precautionary theory framework, one might also consider the strategic management literature to contextualize the findings of this study. This literature indicates that coordination governance or integration decision is driven by a) internal considerations of cost, technology, risk and *financial* management resources, and b) external competitive considerations (Boehlje et al. 2011). Cash holdings, according to a) is potentially a key driver in times of structural changes on industries. Indeed, evidence has shown that the possibility of acquiring

[1] In addition, the model uses cash divided by sales as proxy for cash holdings. The current literature widely uses cash divided to total assets and the logarithm of cash divided by assets net of cash. Cash to sales has been shown to contain excessive outliers in the US stock markets.

other firms or the threat to be acquired more likely increases when cash holdings deviate from normal levels (Harford 1999, Erel et al. 2012, Basmah and Rahatullah 2014) and when new growth opportunities arise in a sector as it seems to be the case of agribusiness. Furthermore, growth opportunities are expected to continue increasing in the near future (Kruchkin 2013). In their discussion on future agribusiness challenges, Boehlje et al. (2011) caution that the impact and consequences of the structural change taking place in agriculture (an influencing almost all participants in the food production and distribution industries) are dramatic and profound. The structural change involves consolidation, vertical integration, and changes in the vertical and horizontal boundaries of firms. Assessing cash holdings might assist in understanding and predicting structural realignments.

Methodology

Models

To model optimal cash holdings we use the panel regression

$$(1)\ Y_{i,t} = \sum_1^k \beta_k X_{itk} + u_i + v_t + \varepsilon_{i,t},$$

where the dependent variable is cash of the i^{th} firm in year t; explained by k firm characteristics supported by the precautionary savings theory, and control variables. Model (1) is a fixed effects model, which assumes that firm cash levels are affected by both the cross-section and time-series. Standard errors are corrected for heteroscedasticity and within cross-section serial correlation.

We use two proxies for cash in accordance to the literature: cash to assets and the logarithm of cash to net assets (assets net of cash). As explanatory variables we use two subsets. First, market to book value (*MTB*), firm size (*Size*), cash flow to assets (*CFtoA*), and firm's cash flow risk (*CFVol*) as the core variables of the precautionary theory. As control variables, we use net working capital (*NWC*), capital expenditures (*Capex*), dividends (*DIV*), and foreign income taxes (*Foreign*). μ_i represents cross-section effects that are constant over time, ν_t represents time effects that are common to all firms, and ε_{it} is the residual error. With the exception of *Foreign*, variables are constructed as in Bates et al. (2009);[2] *Foreign* is a proxy we propose. For replication purposes and/or research transparency, the appendix provides variable definitions, including COMPUSTAT codes.

Ex ante expectations- As elaborated in the previous section, the theory predicts that the level of cash has a negative relation with size and cash flow, and a positive relation with growth opportunities and cash flow volatility. On control variables, as *NWC* is a substitute for cash, a negative relationship is expected. The prediction for *Capex* is unclear; the coefficient would be negative if acquired assets are used as collateral to increase leverage, and in turn to decrease the

[2] *CFVol* is constructed slightly different than in Bates et al. (2009). In this study, cash flow volatility of each firm is used instead of the average across the two-digit SIC codes. The industry average was used only when we had missing data (as explained in the Appendix). Using the firm's cash flow volatility has the advantage in our (sectorial) study that it increases variability within the series.

demand for cash as a precautionary motive. On the other hand, if *Capex* serves as proxy for investment opportunities, the relationship would be positive. For *DIV,* theory predicts a negative sign since stable dividend payers are expected to have greater access to capital markets, and do not need to build up cash for precautionary motives. Finally, as recent studies suggest that cash held by firms in foreign countries affect cash ratios (Cole 2014; Foley et al. 2007, Dittmar and Duchin 2012), *Foreign* controls for this effect. American firms with cash accumulated in foreign jurisdictions may have limitations on cash accessibility associated with repatriation, since firms would face US taxes on repatriated income. Thus, even cash rich firms may have to borrow for operating if the use of internally generated cash would be too costly due to the high repatriation tax burden (Cole 2014). Thus, a positive sign is expected.

In addition, we investigate the effect that cash holding determinants, according to the precautionary theory, have on the probability that an agribusiness is cash rich using the logit regression,

$$(2)\ P_i = \frac{1}{1+e^{-(\sum_1^k \beta_k X_{ik})}},$$

where the dependent variable is an indicator variable set to 1 if the agribusiness is cash-rich or to 0 otherwise; P_i is the probability of being a cash-rich agribusiness firm. The explanatory variables are *MTB*, *Size*, *CFtoA*, and *CFVol*, the core variables from model (1). Model (2) tests the importance of the precautionary theory variables on agribusinesses becoming cash-rich firms. In turn, cash-rich firms are defined as those agribusinesses in the top deciles when the sample is ranked every year in terms of total cash adjusted at 2012 US values; and non-cash-rich agribusiness are those in other deciles. This method follows Dittmar and Duchin (2012).

Data

Financial data from Standard & Poor's COMPUSTAT for the 1970-2012 fiscal years are used.[3] The sample contains agribusinesses listed on US stock exchanges as available in this database. Data are obtained from COMPUSTAT at the 3-, 4-, 5- and 6-digits level of the 2012 North American Classification System (NAICS).[4] We categorize six agribusiness subsectors: 1) agricultural input suppliers (AIS, hereafter); 2) agricultural producers (APD); 3) food processors (FPR); 4) beverage and tobacco product processors (BTP); 5) food and beverage stores (and wholesalers) (FBS); and 6) food service providers (FSP).

Industry Classification

While recent studies across fields of business and economics are still based on the Standard Industrial Classification (SIC), NAICS is used in this study due to the advantages this classification system has compared to SIC (Ambler and Kristoff 1998, Murphy 1998).

[3] Firms with fiscal year end month ending between January and May have a prior year "Fiscal Year." Thus, the sample also contains agribusinesses that "closed" their fiscal years in January thought May 2013.

[4] In NAICS, 3 digits represent subsector; 4 digits, industry group; 5 digits, international (Mexico, USA, and Canada) industry; and 6 digits, US industry. The list of NAICS codes selected for this study is available upon request.

Introduced in 1998 to replace SIC, NAICS is based on a consistent "production-oriented" economic concept on which firms that use the same or similar processes to produce goods and services are grouped together. In contrast, under SIC, some industries were demand-oriented and others production-oriented. The reclassification of industries according to NAICS reflects the structure of the current economy in the US as a response to criticism by analysts regarding SIC as outmoded and not reflective of the economy.[5]

Table 1 provides a breakdown of the sample, which contains a total of 995 agribusiness and 13,686 firm-years, with NAICS codes indicated in parenthesis. Agricultural input suppliers (AIS), which represents around 11% of the sample, is mainly formed by seed, pesticide, and fertilizer providers, and by machinery equipment firms. Agricultural producers (APD), 9% observations, is mainly comprised by crop, animal, and forestry production. Food and beverage manufactures, are broken down in two subsectors, food processors (FPR), with around 35% of the sample, and beverage tobacco product processors (BTP), with 13%. Food and beverage stores (and wholesalers) (FBS), with 19%, represents food and beverage retailers mainly. Finally, food service providers (FSP) (13%) has food services and drinking places.

Our agribusiness sector sample is comprehensive as in Sonka and Hudson's (1989) depiction of agribusiness, which conceives the sector as a sequence of interrelated activities made up of genetics and seedstock firms, input suppliers, agricultural producers, merchandisers or first handlers, processors, wholesalers, food retailers, and food service providers.[6]

Table 2 provides descriptive statistics for the sample. Panel A presents the complete period, 1970 to 2012, and Panel B 2000 to 2012. The means and medians of cash ratios are similar in both periods, no statistical difference exists between the series. Cash in agribusiness has not experienced the dramatic increase that the whole US market has in the last decade.

Figure 1 compares means and medians of cash to assets for agribusiness and the complete US market. The statistics in Figure 1 for the whole market are similar/comparable to those estimated

[5] Comparing industry grouping accuracies under different classification systems is out of the scope of this study. Some studies have shown that NAICS might be superior to SIC. Kelton et al. (2008) document that the model by Feser and Bergman (2000) to identify US national-level clusters works better when firms are grouped by NAICS instead of SIC. The classification of firms using NAICS produces mixed-sectors clusters that better capture the relationships among industries in the US economy. In financial accounting, field of this study, Krishan and Press (2003) compare the dispersion of financial ratios using COMPUSTAT data within SIC and NAICS and find that NAICS generates more homogenous industries, particularly for manufacturing, transportation, and services. While those studies have documented NAICS as a superior classification system over SIC, results could not be generalized as research results depend on specific research design and sample properties (Krishan and Press 2003). Some studies related to stock returns and market anomalies use either the Global Industrial Classification Standard (GICS) or the Fama and French industry classification (Fama and French 1997). These classifications are broad, however, for our purposes to study intra-sector variations on cash holdings for agribusinesses.

[6] COMPUSTAT contains agribusinesses that would allow the categorization of additional subsectors. For instance, there were 538 observations of food and beverage wholesalers (F&B wholesalers, in Table 1). However, as these observations represent only 3.9% of the sample, we decided to include them in the "food and beverage stores (and wholesalers)" subsector, FBS, as wholesalers provide services to these retailers in this subsector. Similarly, "farm supplies wholesalers" were added to AIS since they only represented 0.3% of the sample. Finally, "farm product raw material wholesalers," 1.1%, were included in APD.

in Bates et al. (2009) for 1980-2006. Figure 2 depicts the relationship between cash to assets and the core variables by the precautionary theory over time for agribusiness. Growth opportunities and size for agribusiness firms have consistently grown over time even when cash decreased. Interestingly, the levels of *Size* and *MTB* grew faster in the last decade, in tandem with cash. The positive relationship of growth opportunities and cash is consistent with the precautionary theory. Cash flow volatility has also increased over time but it has been stable during the last decade. Finally, cash flow has been more erratic during the period analyzed.

Table 1. Agribusiness and Subsectors

Agribusiness Subsectors	Firms	Firm-Years
Agricultural Input Suppliers (AIS)	**109**	**1,396**
Ag. Input Suppliers	105	1,351
Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing (3253 up to 6 digits)	58	674
Seeds (111, 111150, and 111920)	17	162
Agricultural Implement Manufacturing (33311)	30	515
Farm Supplies Wholesalers	4	45
Farm Supplies Merchant Wholesalers (42491 up to 6 digits)	3	23
Farm and Garden Machinery and Equipment Merchant Wholesalers (42382)	1	22
Agricultural Producers (APD)	**100**	**1,164**
Ag. Producers	93	1,015
Crop Production (111 up to 6 digits, except 111,111150, and 111920)	39	523
Animal Production and Aquaculture (112 up to 6 digits)	22	168
Forestry and Logging (113 up to 6 digits)	17	205
Fishing, Hunting and Trapping (114 up to 6 digits)	2	40
Support Activities for Agriculture and Forestry (115 up to 6 digits)	13	79
Farm Product Raw Material Wholesalers	7	149
Farm Product Raw Material Merchant Wholesalers (4245 up to 6 digits)	7	149
Food Processors (FPR)	**345**	**4,768**
Food Manufacturing (311 up to 6-digits)	342	4,739
Food Product Machinery Manufacturing (333241)	3	29
Beverage and Tobacco Product Processors (BTP)	**134**	**1,666**
Beverage and Tobacco Product Manufacturing (312 up to 6 digits)	134	1,666
Food and beverage stores (and wholesalers) (FBS)	**178**	**2,786**
F&B Stores	139	2,248
Food and Beverage Stores (445 up to 6 digits)	139	2,248
F&B Wholesalers	39	538
Grocery and Related Product Merchant Wholesalers (4244 up to 6 digits)	34	449
Tobacco and Tobacco Product Merchant Wholesalers (42494)	3	67
Beer, Wine, and Distilled Alcoholic Beverage Merchant Wholesalers (4248 up to 6 digits)	2	22
Food service providers (FSP)	**129**	**1,906**
Food Services and Drinking Places (722 up to 6 digits)	129	1,906
Agribusiness (AGB)	**995**	**13,686**

Notes. The sample contains agribusinesses traded in US stock exchanges with data available in Standard and Poor's COMPUSTAT from 1970 to 2012 fiscal years. Both, active and inactive firms are considered in this study. Canadian agribusinesses, 2,205 firm-years, considered domestic firms in COMPUSTAT, are included in the sample. Firm-years with zero, negative, or missing revenues in COMPUSTAT were excluded from the sample (179 observations). NAICS codes in parenthesis.

Table 2. Descriptive Statistics

	Mean	Median	Std. Dev.	N
Panel A: 1970-2012				
CtoA	0.098	0.050	0.134	13,686
CtoNA	0.307	0.053	8.006	13,684
MTB	2.171	1.304	11.321	11,522
Size	5.861	5.902	-0.226	13,686
CFtoA	-0.019	0.067	1.281	13,658
CFVol	0.069	0.028	0.250	13,664
NWC	-0.043	0.051	2.381	13,513
Capex	0.078	0.059	0.075	13,243
DIV	0.522	1.000	0.500	13,686
Foreign	0.283	0.000	0.451	10,315
Panel B: 2000-2012				
CtoA	0.101	0.052	0.136	4,670
CtoNA	0.218	0.055	1.439	4,668
MTB	3.062	1.449	18.515	4,155
Size	6.093	6.219	2.623	4,670
CFtoA	-0.102	0.066	2.148	4,665
CFVol	0.098	0.032	0.394	4,653
NWC	-0.220	0.003	4.001	4,631
Capex	0.061	0.042	0.065	4,498
DIV	0.452	0.000	0.498	4,670
Foreign	0.404	0.000	0.491	3,319

Notes. Sample description in Table 1. *CtoA* is cash to assets; *CtoNA* is cash to net assets; *MTB* is market to book value; *Size* is firm size, the logarithm of assets in 2012 USD values; *CFtoA* is cash flow to assets; *CFVol* is volatility of cash flows; *NWC* is net working capital to assets; *Capex* is capital expenditures divided by assets; *DIV* is a dividend payout dummy variable, set to 1 in years in which firms pay common dividends; and *Foreign* is a dummy variable set to 1 when a firm report foreign income taxes. Definition of variables in the Appendix.

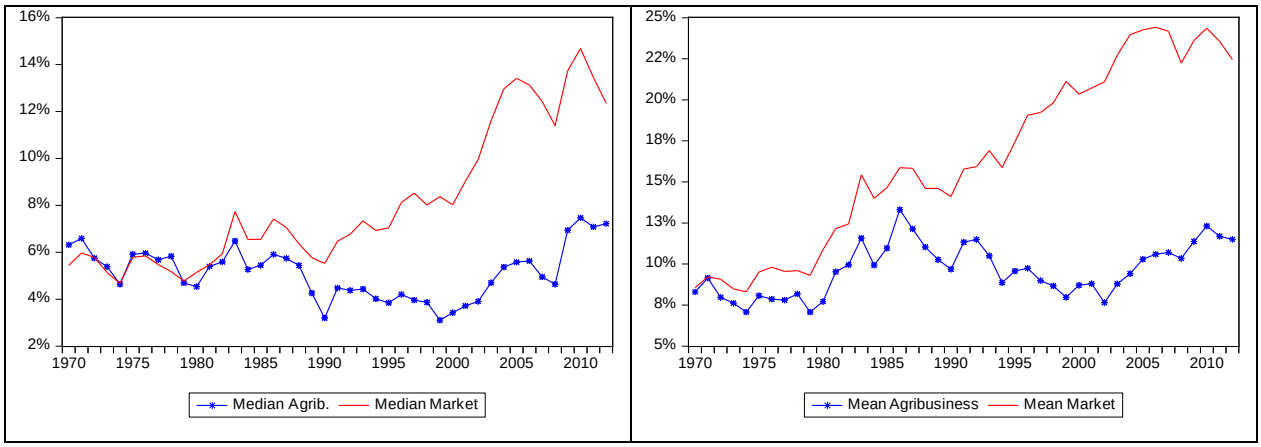

Figure 1. Cash to Assets for Agribusiness and the Complete US Market, 1970-2012

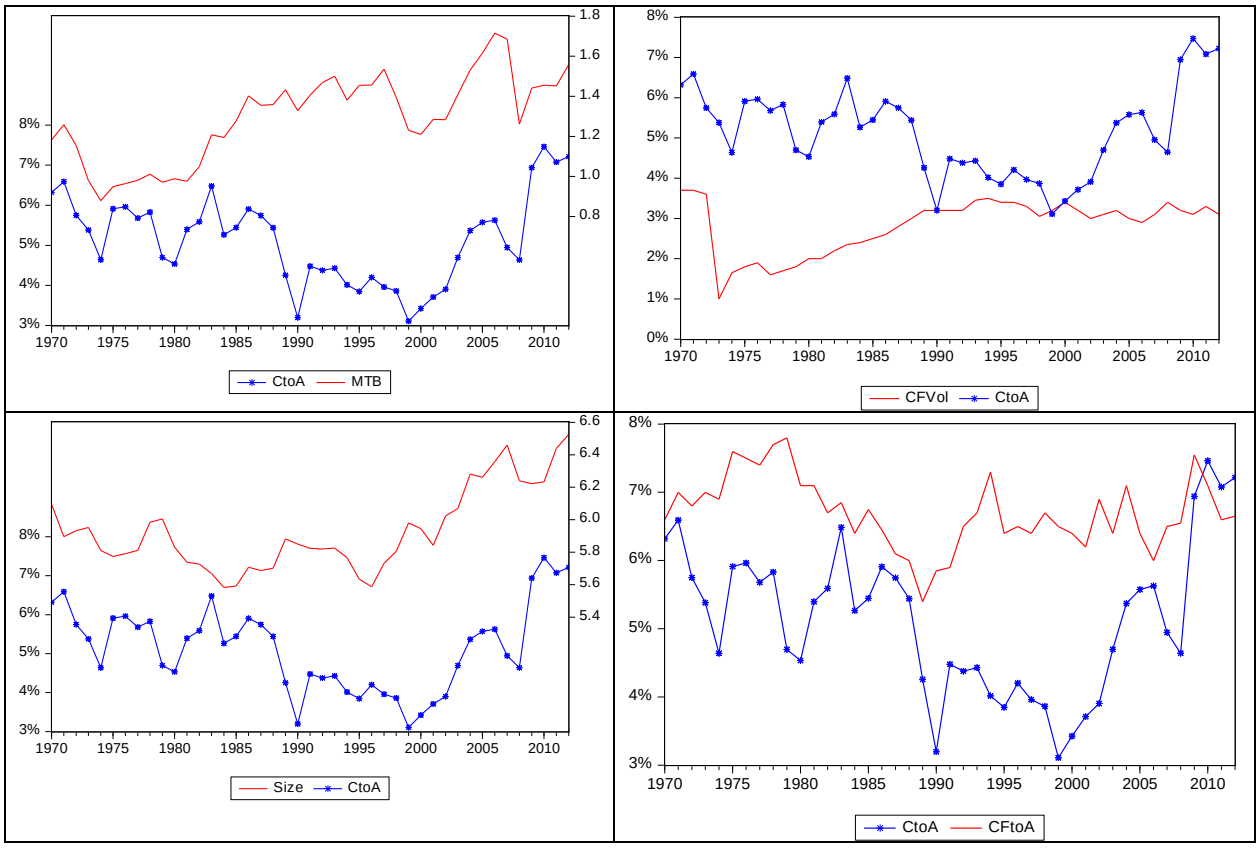

Figure 2. Cash to Assets and Selected Firm Characteristics for Agribusiness, 1970-2012

Notes. *CtoA* is cash to assets; *MTB* is market to book value; *Size* is firm size, the logarithm of assets in 2012 USD values; *CFtoA* is cash flow to assets; and *CFVol* is volatility of cash flows. *MTB* and *Size* scales in the right axis. Median values plotted.

Results

Optimal Cash Holding Model for Agribusiness

Table 3 provides results of model (1). Panel A uses cash to assets as dependent variable, and Panel B uses the natural logarithm of cash to net assets. Models 1a and 1b use as explanatory the core variables of the precautionary theory: growth opportunities (*MTB*), firm size (*Size*), cash flow level (*CFtoA*), and volatility of cash flows (*CFVol*). Models 2a and 2b add control variables net working capital (*NWC*), capital expenditures (*Capex*), and dividends (*DIV*). Models 3a and 3b include foreign income taxes (*Foreign*). Standard errors, in Table 3, are heteroscedastic and within cross-section serial correlation robust.[7]

We discuss results on models 1a, 2a, 1b, and 2b together first. With a few exceptions, estimates are statistically significant. *MTB*, the proxy for the likelihood of a firm having positive NPV projects in the future, or for growth opportunities embedded in current values of agribusiness

[7] We implement White Period (cluster by cross-section) error estimates, which are heteroskedastic and cluster robust so that they allow for $E(u_{i,t}u_i)$ to be non-zero for $t <> s$ and to differ across periods.

firms, is positive. Agribusinesses hold cash levels in direct relation to *MTB* in order to be able to fund those foreseeing investment opportunities. *Size* estimates are negative. Small agribusiness firms need higher cash ratios relative to large firms, as it is more costly for them to raise funds in case of cash shortfall. With the exception of 1b, *CFtoA* is not statistically significant.[8] A negative *CFVol* estimate for agribusiness firms is inconsistent with the precautionary theory, which predicts that firms will increase cash on their balance sheets when cash flows become more volatile.[9]

On the control variables, *NWC* and *Capex* are expected to be negative because *NWC* is a substitute of cash and *Capex* could serve as collateral to raise capital in cash shortfall situations. The *NWC* estimates are not statistically significant. *Capex* is negative and statistically significant. Finally, *DIV* is positive, and statistically significant in 2a. Theory predicts a negative sign since dividend payers are stable firms expected to have greater access to capital markets – compared to non-dividend payers, and not in need to build up cash for precautionary motives. Overall, results of models 1 and 2 are consistent with the cash holdings precautionary savings theory. The relevant exceptions are the signs of cash flow volatility and dividends. We try to explain this later in this article.

As recent studies suggest that cash held by firms in foreign countries affect cash ratios (Cole 2014; Foley et al. 2007, Dittmar and Duchin 2012), in models 3a and 3b we include the dummy variable *Foreign* for firms reporting foreign income taxes. The explanatory power of the models marginally increase with this variable, and the estimates of models 3a and 3b are similar to 2a and 2b. However, while the sign of *Foreign* tends to be positive, we do not find statistically significance in the agribusiness sample.

Subsectors

We also run model (1) for the six agribusiness subsectors. Results are in Table 4, with cash to assets as dependent variable in Panel A and the logarithm of cash to net assets in Panel B. In general, results are consistent with the predictions by the precautionary theory for the FPR, FBS, FSP, and APD subsectors. The exceptions are those noted previously for the complete agribusiness sample, and differences that might be related to the nature of the specific subsector, which we discuss below. The results for AIS and BTP, however, are difficult to explain with this model.

The FSP subsector has a statistically significant negative *NWC* estimate, inconsistent with the theory for the average firm, but consistent with the nature of restaurants, with negative working capital, defined as current assets net of cash minus current liabilities. FPR, which comprises

[8] We define cash flow as in Bates et al. (2009), namely cash flow after deducting dividends paid but before working capital and capital expenditures. We used alternative proxies for cash flow, namely, cash flow before dividends (as in Dittmar and Duchin 2012), and cash flow from operations taken directly from the statement of cash flow (the problem with the later approach is that the sample is significantly reduced). Results, untabulated, are similar.

[9] Since this is a significant deviation from the theory, we also run the regression using the standard deviations of cash flow to assets in the same way as in model (1) but without inputting the industry cash flow volatility in case of missing values. The results, untabulated, are similar; the sample is reduced from around 8,500 observations (in column 3a) to about 7,200.

financially strong firms such as ADM or Kraft Foods, has a positive, statistically significant *CFtoA* estimate in both panels in Table 4, implying that firms with high levels of cash flow also hold high cash in their balance sheets. This is inconsistent with the precautionary theory, and in line with the idea that cash-rich firms could accumulate cash even when they do not need it. Finally, in both panels, the signs of *DIV* are positive and statistically significant for BTP, a mature with low growth opportunities segment, which could be another characteristic of cash-rich firms. Cash-richness is analyzed in the following section.

Table 3. Fixed Effects Regressions for Agribusiness

Panel A: Dependent Variable is Cash to Assets						
	[1a]		[2a]		[3a]	
	Estimate	p	Estimate	p	Estimate	p
Intercept	0.148***	0.000	0.181***	0.000	0.197***	0.000
MTB	0.001***	0.000	0.002*	0.087	0.002	0.110
Size	-0.008*	0.076	-0.013***	0.006	-0.015***	0.008
CFtoA	-0.005	0.328	0.020	0.184	0.023	0.119
CFVol	-0.035*	0.077	-0.067**	0.038	-0.095***	0.002
NWC			-0.011	0.345	-0.016	0.156
Capex			-0.131***	0.000	-0.151***	0.000
Div			0.011**	0.023	0.013**	0.025
Foreign					0.000	0.963
Adj R. Squared	0.514		0.527		0.531	
Panel B: Dependent Variable is Log(Cash to Net Assets)						
	[1b]		[2b]		[3b]	
	Estimate	p	Estimate	p	Estimate	p
Intercept	-1.895***	0.000	-1.584***	0.000	-1.359***	0.000
MTB	0.007***	0.000	0.016*	0.068	0.015*	0.084
Size	-0.170***	0.001	-0.223***	0.000	-0.256***	0.000
CFtoA	0.057*	0.072	0.154	0.197	0.174	0.114
CFVol	-0.356**	0.028	-0.587**	0.029	-0.881***	0.000
NWC			-0.015	0.859	-0.059	0.453
Capex			-0.780***	0.009	-0.948***	0.004
DIV			0.103	0.115	0.133*	0.061
Foreign					0.024	0.837
Adj R. Squared	0.496		0.508		0.521	
N	11,484		11,007		8,496	
Firms (Years)	867 (43)		859 (43)		730 (43)	

Notes. Regression results of model (1), 1970-2012. *MTB* is market to book value; *Size* is firm size, the logarithm of assets in 2012 USD values; *CFtoA* is cash flow to assets; *CFVol* is volatility of cash flows; *NWC* is net working capital to assets; *Capex* is capital expenditures divided by assets; *DIV* is a dividend payout dummy variable, set to 1 in years in which firms pay common dividends; and *Foreign* is a dummy variable set to 1 when a firm report foreign income taxes. Dependent variables indicated in the top of panels. Definition of variables in the Appendix. ***1%, **5%, and *10% statistical significance level.

Table 4. Fixed Effects Regressions for Agribusiness Subsectors

	AIS	APD	FPR	BTP	FBS	FSP
Panel A: Dependent variable is Cash to Assets						
Intercept	0.150	-0.043	0.211***	0.133	0.221	0.273***
MTB	0.001	0.004*	0.009***	0.001	0.000	0.028***
Size	-0.002	0.030	-0.017**	-0.008	-0.019	-0.033***
CFtoA	0.033	0.022	0.120***	0.021	-0.037	-0.118**
CFVol	-0.077*	-0.183**	-0.053*	-0.145*	-0.006	-0.027
NWC	-0.030	-0.044	-0.035**	-0.012	-0.061**	0.150***
Capex	-0.248	-0.053	-0.278***	0.003	-0.290***	-0.159***
DIV	0.029*	0.032**	0.007	0.053***	0.017	-0.002
Foreign	-0.011	0.069	-0.005	-0.001	0.008	0.010
Adj R. Squared	0.614	0.604	0.556	0.546	0.502	0.418
Panel B: Dependent variable is Cash to Net Assets						
Intercept	-1.949*	-4.910***	-1.557***	-0.306	-0.677	-1.190**
MTB	0.007	0.041**	0.074***	0.009	0.000	0.272***
Size	-0.194	0.394**	-0.208**	-0.454**	-0.330***	-0.338***
CFtoA	0.233	-0.099	0.915***	0.113	-0.653*	-0.400
CFVol	-0.383	-0.800	-0.660**	-3.006***	-1.435*	1.273
NWC	-0.016	-0.442**	-0.175	-0.031	-0.644**	1.029**
Capex	-0.620	0.139	-1.898***	0.865	-3.323***	-1.545***
DIV	0.265	0.093	-0.025	0.531**	0.168	0.117
Foreign	0.250	0.472	-0.045	-0.017	0.238	-0.081
Adj R. Squared	0.556	0.636	0.530	0.525	0.541	0.460
N	845	655	3,049	883	1,776	1,288
Firms (Years)	86 (43)	74 (43)	248 (43)	94 (43)	127 (43)	101 (43)

Notes. Regression results of model (1), 1970-2012. AIS is Agricultural Input Suppliers subsector; APD, Agricultural Producers; FPR, Food Processors; BTP, Beverage and Tobacco Product Processors; FBS, Food and beverage stores (and wholesalers); and FSP, Food service providers. *MTB* is market to book value; *Size* is firm size, the logarithm of assets in 2012 USD values; *CFtoA* is cash flow to assets; *CFVol* is volatility of cash flows; *NWC* is net working capital to assets; *Capex* is capital expenditures divided by assets; *DIV* is a dividend payout dummy variable, set to 1 in years in which firms pay common dividends; and *Foreign* is a dummy variable set to 1 when a firm report foreign income taxes. Dependent variables indicated in the top of panels. Definition of variables in the Appendix. ***1%, **5%, and *10% statistical significance level.

Cash-Rich Agribusiness Firms

Following Dittmar and Duchin (2012), we define cash-rich agribusiness firms as those in the top deciles when the sample is ranked every year in terms of total cash adjusted by the consumer price index, and non-cash-rich agribusiness are those in other deciles. Panel A of Table 5 shows descriptive statistics by deciles for the complete period of study. Similar to the findings by Dittmar and Duchin (2012) for the entire US market, cash is highly concentrated in agribusiness. Decile 10, with the largest cash reserves, accounts for 78.5% of the aggregate cash by agribusiness firms (this compares to 77.6% reported by Dittmar and Duchin 2012, for the complete US market). Further, cash-rich agribusiness firms concentrate 68% of total net income,

49% of total revenues, and 59% of total assets. Panel B compares cash-rich and non cash-rich (those in deciles 1 to 9) in terms of cash ratios and variables in the precautionary theory.

Table 6 provides the results of logit model (2) for cash-rich agribusiness firms. An agribusiness firm is significantly more likely to become cash-rich if it is larger and has lower and less volatile cash flow to assets. *MTB*, proxy of growth opportunities, is not statistically significant. The logit regression results do not support the free cash flow hypothesis in cash-rich agribusiness firms. The free cash flow hypothesis predicts that managers in firms generating high cash flows and with low growth opportunities accumulate excessive cash for their own benefit. The flip side of this implication is that cash-rich agribusinesses, large firms with low cash flow volatility relative to the average agribusiness, could be ready to further consolidate the agribusiness sector; we elaborate on this in the following section.

Table 5. Concentration of Cash by Deciles and Selected Firm Characteristics for Agribusinesses

Panel A: All Deciles

Cash Decile	Fraction of Cash	Fraction of Income	Fraction of Revenue	Fraction of Assets	C toA mean	CtoA median
1	0.000	0.001	0.004	0.003	0.036	0.009
2	0.001	0.004	0.007	0.005	0.062	0.027
3	0.001	0.004	0.011	0.007	0.086	0.039
4	0.003	0.005	0.016	0.010	0.101	0.042
5	0.006	0.009	0.028	0.018	0.104	0.046
6	0.012	0.018	0.041	0.029	0.109	0.054
7	0.022	0.025	0.060	0.044	0.128	0.067
8	0.048	0.064	0.115	0.092	0.120	0.069
9	0.123	0.191	0.228	0.205	0.103	0.064
10	0.785	0.679	0.490	0.588	0.127	0.100

Panel B: Decile 10 and All other Deciles

	CtoA mean	CtoA median	MTB mean	Size mean	CFtoA mean	CFVol mean
Cash-rich	0.127	0.100	1.806	9.313	0.060	0.024
Non cash-rich	0.094	0.044	2.215	5.470	-0.027	0.074
t-statistic	8.524	23.570	-1.211	65.168	2.411	-6.980

Notes. Panel A provides firm characteristics of agribusiness by cash deciles. Agribusinesses were ranked every year in terms of total cash adjusted by the CPI in 2012 USD values. The second column shows the fraction of total cash by deciles during 1970-2012. The fractions of total income (Compustat item NI), of total revenue (SALE), and total assets (AT) by deciles are shown in the next columns. The last two columns of Panel A provide means and medians of cash to assets. Panel B compares cash-rich (decile 10) and non cash-rich agribusiness (deciles other than 10).

Conclusions and Implications

In this section, we summarize our findings and interpret them in the context of potential structural changes in this sector. Table 7, which summarizes the main results of this study, shows the predictions by the precautionary theory with respect to its core variables and the results of models (1) and (2). The fixed-effect regressions, based in model (1), reported that cash is positively, and statistically significant, related to growth opportunities, and negatively related to

firm size. Agribusinesses with higher opportunities would retain more cash to internally fund investments partially or totally without the need to seek external financing, which might be costly or unavailable. This reduces the likelihood of underinvestment on foreseen positive NPV projects. The negative relation between cash and firm size is consistent with the view that smaller (higher) agribusinesses could find high cash holdings more (less) valuable as the access to credit is more (less) limited for them. Somewhat puzzling is the negative relation of cash flow from operations volatility with cash holdings since according to the precautionary theory cash is expected to increase as uncertainty (e.g., cash flow volatility) heightens. Overall, our results for the agribusiness sector are similar to results in studies for the whole US market (Opler et al. 1999, Harford 1999, Bates et al. 2009).[10]

The focus on the subset of cash-rich agribusiness, defined as firms in the top decile when the sample is ranked every year in terms of total cash adjusted by the consumer price index, provides additional insights and relevant potential implications for management. The logit regression, model (2), confirmed that the larger the agribusiness firm and the lower the level of cash flow volatility the more likely to become cash-rich. These two deviations from the precautionary theory are consistent with the study by Dittmar and Duchin (2012) for the whole US market. Ditmar and Duchin, however, document that the precautionary theory fails to explain the signs of all four variables for the subset of cash-rich firms, and propose a behavioral explanation (e.g., managers in those firms are overly conservative). The main difference of our results, as they relate to the subset of cash-rich agribusiness firms, is that growth opportunities do not drive agribusiness firms in their cash accumulation behavior (model 2).

Thus, one might conclude that the precautionary theory explains optimal cash holdings for the average agribusiness firm but does not explain cash holdings for the subset of cash-rich agribusiness. Furthermore, these deviations are relevant from a managerial perspective because cash-rich agribusinesses are large firms, with stable cash flow of operations generation, and with no more growth opportunities compared to opportunities an average agribusiness has. One of the possible implications of this finding is that agribusiness are hoarding cash to take advantage of growth opportunities through acquisition and resulting consolidation of firms. This is particularly important for this industry due to the upward trend of growth opportunities for agribusiness in the last decade (Figure 2), and given that growth opportunities are expected to continue increasing in the near future according to scholars in this field.

[10] In addition, our cash flow to assets estimate is not statistically significant. Estimates for cash flow to assets have been inconsistent across studies in the literature. For instance, Harford's (1999) estimate is not statistically significant; and Bates et al. (2009) document statistical significance in six out of the nine model specifications, and inconsistent signs. Thus, the direction of the relationship between cash holdings and the magnitude of cash flow seems empirically unclear.

Table 6. Logit Regressions for Cash-Rich Agribusinesses

Intercept	-2.074***	-13.585***	-2.232***	-1.397***	-13.175***
MTB	-0.011				-0.002
Size		1.462***			1.430***
CFtoA			1.314***		-0.164***
CFVol				-23.384***	-2.161*
McFadden R-squared	0.000	0.510	0.006	0.060	0.504
N	11,502	13,686	13,658	13,664	11,484
Obs. with Dep.=0	10,241	12,294	12,266	12,272	10,223
Obs. with Dep.=1	1,261	1,392	1,392	1,392	1,261

Notes. Regression results of model (2), 1970-2012. The dependent variable is a binary variable, set to 1 if the agribusiness is ranked in decile 10 (e.g., cash-rich) or 0 otherwise. *MTB* is market to book value; *Size* is firm size, the logarithm of assets in 2012 USD values; *CFtoA* is cash flow to assets; *CFVol* is volatility of cash flows; and *DIV* is a dividend payout dummy variable, set to 1 in years in which firms pay common dividends.

Table 7. Predictions by the Precautionary Theory and Results for the Agribusiness Sample and for Cash-Rich Agribusiness

Variables	Predictions PT	All agb (model 1)	Cash-rich agb only (model 2)
MTB	Positive	Positive (as predicted)	No significant
Size	Negative	Negative **(**as predicted)	Positive (deviation)
CFtoA	Negative	No significant	Negative **(**as predicted)
CFVol	Positive	Negative (deviation)	Negative (deviation)

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Appendix. Variable Definitions

Compustat items are in brackets.

Dependent variables:

CtoA = Cash to Assets: Cash and short-term investment divided by assets (CHE / AT).
CtoNA = Cash to Net Assets: Cash and short-term investments divided by net assets [CHE / (AT – CHE)]. We use the logarithm of CtoNA as dependent variable.

Explanatory variables:

MTB = Market Value to Book Value: Total assets minus book value of equity plus the market value of equity (Price at fiscal year close times common shares outstanding), all divided by total assets [AT – CEQ + (PRCC_F * CSHO)] / AT.

Size = Firm size in 2012 USD values: The logarithm of assets in 2012 USD values; 2012 USD values adjusted by using the consumer price index available in the USA Department of Labor. Log(AT in 2012 USD Values).

CFtoA = Cash flow to assets: Earnings after interest, dividends, and taxes but before depreciation and amortization divided by total assets [(OIBDP – XINT – TXT – DVC) / AT].

NWC = Net working capital to assets: Working capital minus cash plus short-term investments all divided by assets minus cash and short term investments [(WCAP – CHE) / (AT – CHE)].

Capex = Capital expenditures to assets: Capex divided by assets (CAPX / AT).

CFVol = Cash flow risk: The standard deviation of cash flow to assets for the previous ten years (requiring at least 3 years for this computation) for each firm. For missing values, the average of the cash flow standard deviation from the industry was used.

DIV = Dividends: Dividend payout dummy variable, set to 1 in years in which firms pay common dividends (DVC), and to 0 otherwise.

Foreign = Foreign Taxes: Dummy variable, set to 1 in years in which firms report foreign income taxes (TAXFO), and to 0 otherwise.

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Senior Management's Influence on New Product Development Projects and Firm Performance in Small and Medium-Sized Food Companies

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Abstract

This paper analyses direct and indirect effects of senior management behavior on the success of new product development projects and firm performance. To examine these behaviors, a PLS-structural equation model is applied to survey data collected from R&D-managers of small and medium-sized food and drink companies in Germany. Results found that project planning and process performance are able to mediate about 50% of the total impact of senior management support on project performance, with project planning being the more important mediator. Effects on firm performance are also largely mediated through its antecedents in the proposed model.

Keywords: new product development; innovation management; top management activities; resource allocation; SMEs

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Introduction

Continuous development and continual new product-launches are considered two important elements in a firm's formula to achieve sustainable success (e.g. Cooper 1994, Hauser et al. 2006). Over the last decades a vast amount of literature has identified the factors influencing successful new product development (NPD) projects (for an overview, see Evanschitzky et al. 2012, Henard and Szymanski 2001, Montoya-Weiss and Calantone 1994). One factor critical to the success of major innovation outcomes, is senior management support. In general, senior management support is defined as the "degree of senior management support [provided] for a new product initiative" (Evanschitzky et al. 2012, S. 37) . Based on this definition, most of the previous studies have focused on direct effects of senior management support on NPD success or on other factors that were hypothesized to influence NPD success. For example, Akgün et al. (2007) demonstrated that stress and crises with project teams increase NPD-success, but only when senior management support is high. Another study showed that a high degree of senior management support has strong positive impacts on financial success, design quality and achievement of time sensitive goals of NPD projects (Swink 2000). However, the positive effects on financial success were moderated by the degree of technological innovation. Thus, in this example senior management support was moderated by a third factor. Effects of senior management support on NPD success were also investigated with a special focus on the food industry. For example, Hoban (1998) as well as Kristensten et al. (1998) detected positive direct effects of senior management support while Stewart-Knox et al. (2003) did not find such a positive effect on the success of new low-fat products.

These and other studies on senior management support undoubtedly provide valuable insights for managers inside and outside the food industry, especially because management practices and principles do not differ significantly between the food sector and other industries (Anderson 2008). On the other hand, previous studies have two important limitations that we seek to address with the present study. First, as described above, only direct and moderating effects of senior management support were addressed in the past. As a consequence, the potential presence of indirect effects of senior management support on NPD and firm performance was ignored, which could lead to an underestimation of senior management's total impact on various success factors. In other words, as NPD and firm performance are just the final outcome variables, it seems likely that senior management support is not only directly relevant for NPD success, but is essential to the outcome and success of different stages preceding NPD and firm performance, such as project planning and the realization of an NPD project. Secondly, although we acknowledge the argument that management practices do not differ significantly between industries (Anderson 2008), there are important specialities with food manufacturing companies that are relevant to the outcome of innovation studies. For example, within the food industry, primarily new products with a relatively low level of newness are developed (Menrad 2004, van Trijp and van Kleef 2008). Additionally, product newness itself was found to have a significant direct and moderating effect on new product performance (Gielens and Steenkamp 2007). Therefore, when not controlling for the different levels of innovativeness in different industries, the results are likely to be biased or misinterpreted.

Based on the described limitations, the present study analyses how senior management support influences the different phases of NPD projects as well as both project performance and the

overall performance of the company. Compared to previous studies, we focus on the direct and indirect effects of senior management support. Therefore, this study demonstrates that the decisions and behaviours of senior management have *direct and indirect* effects on the various stages followed by all NPD projects. So, the study may help senior managers within the food and drink sector better understand the overall importance of their role in contributing to NPD success.

To test the proposed hypotheses and assumptions of this paper, data from SMEs in the German food and drink industry are analysed. SMEs were chosen for two reasons. First, about 99% of companies in Europe's food and drink industry fall within the definition of SMEs (FoodDrinkEurope 2013) which means that our study is able to address the majority of the food (and drink) companies. Secondly, SMEs are thought to have flatter hierarchies with CEOs and senior management teams participating to a greater degree in the operational implementation of strategies (Lubatkin 2006).

This paper is structured as follows. First, we present an overview of the proposed model and draw attention to the operationalization constructs of the model used in the study. We then describe the constructs in more detail and formulate hypotheses concerning both direct and indirect construct relationships. The methodology section is followed by the presentation of the model results. Finally, the results are discussed, followed by the conclusions and implications for management.

The Model

In order to achieve the overall goal of this paper, i.e., to demonstrate the direct and indirect effects of senior management support on NPD and firm performance, we formulate a structural equation model that includes five substantive constructs (see Figure 1). As this paper focuses on operational senior management support rather than on strategic guidance, we call our main construct operational managerial responsibility (OMR). OMR is conceptualized as a higher-order construct consisting of two lower-order constructs which are referred to as team resource allocation (TRA) and cooperation (COOP). The reasons for this conceptualization follow. Innovation is considered a complex process in which existing knowledge is used to generate innovation outcomes, such as new products, services, procedures or new knowledge (Brown and Duguid 1991, Lee et al. 2003, Mors 2010). However, existing knowledge is spread across the firm and not accessible in every situation. Therefore, teams have to be assembled by the senior management in order to receive the necessary knowledge which is fundamental for successful innovation projects (Bonner et al. 2002, Koch 2012, Sears and Baba 2011). However, such cross-functional integration in the form of team foundation is not sufficient to describe the sub-construct of TRA. Teams must be given different levels of competence (Koch 2012). The organizational structure which defines the rules for the allocation of these competences is under managerial control (Droge et al. 2008). Since upper management is responsible for the allocation of autonomy, time and money, these sub dimensions are also included in the TRA construct (see Table 2).

The second lower-order construct of OMR is cooperation (COOP), which includes functional cooperation as well as managerial involvement. Although teams are formed to incorporate

necessary knowledge into the innovation project, communication and cooperation between functions seem to be stumbling blocks (Koch 2012). Managerial involvement is important because communication and knowledge transfer are not accompanied by the formation of cross-functional teams alone. As the governing authority, it's upper management's role to model cross-functional communication and cooperation in order to create an atmosphere where communication networks can flourish.(Henard and Szymanski 2001).

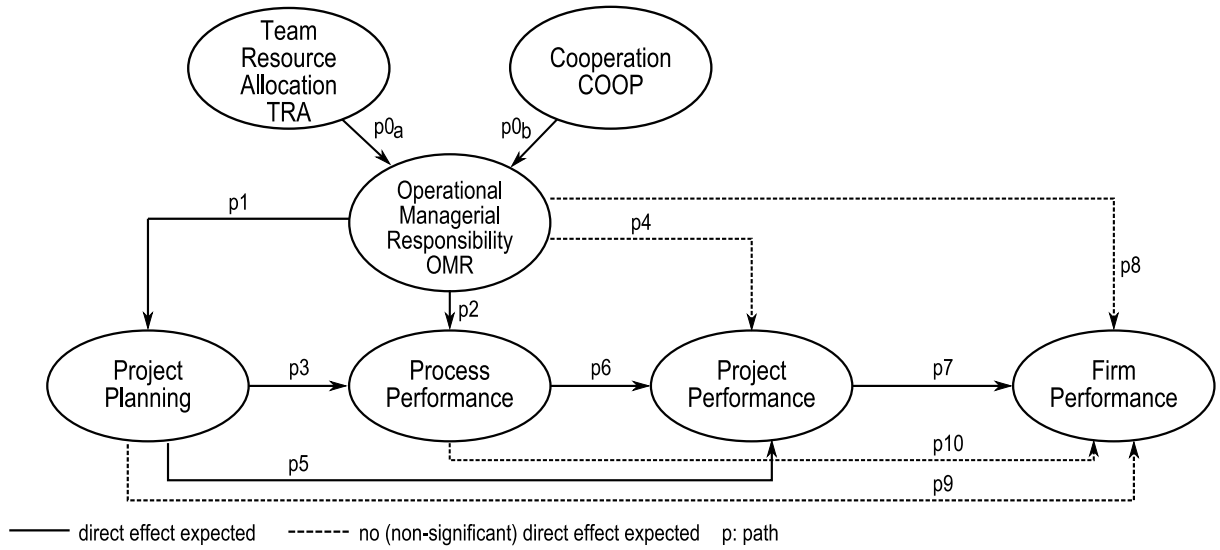

Figure 1. Proposed Relationships between Model Constructs.

Direct Model Relationships

The major objective of this paper is to illustrate the direct and especially the indirect ways in which the actions of senior management affect project and firm performance. To detect indirect effects, the direct effects of outcome variables on antecedents need to be demonstrated. Therefore, project planning and process performance are included as antecedents of project performance and firm performance. We expected OMR and its sub-dimensions to have positive direct effects on project planning and process performance as well as indirect effects on both project performance and firm performance (see Figure 1).

Project planning can be defined as the intensity of planning activities prior to the realization of a NPD project. We argue that project teams which are given adequate time, money and decision-making autonomy are more likely to create and use comprehensive project plans to underpin their NPD projects. For instance, cross-functional knowledge (which is covered in the TRA construct) is already a requirement at this stage and should support planning outcomes (Thieme et al. 2003, Verworn 2009). Cross-functional communication further facilitates effective planning by overcoming conflicts that may arise due to differences in cultural origin, personality or ways of thinking (Thieme et al. 2003). Thus OMR and its sub-dimensions should have a positive impact on project planning.

Project planning is directly followed by the realization of the NPD-project (Khurana and Rosenthal 1997). In our study we call this stage process performance. The overall goal in this phase is to convert new ideas into new products. However, teams should (a) stay within defined budgets and deadlines (Sáenz et al. 2009); and (b) make constructive use of external contacts and suggestions (Cooper and Kleinschmidt 2011, Menrad 2004). Both, team motivation and good communication play a major role in this phase of the NPD project. The use of cross-functional teams should facilitate the use of external contacts and suggestions because such team members bring diverse external experiences from their day-to-day operations. For example, marketing and sales personnel cultivate contacts with potential customers and should therefore be able to contribute information on present and future customer requirements. Purchasing agents, on the other hand, could have information on the latest production techniques or packing materials that could potentially be incorporated into the project-realization phase. As in project planning, communication and cooperation also support good process performance. The participation of senior management and the reinforcement of good communication should contribute positively to team performance in the project-realization phase. Furthermore, senior management plays a supervisory role that helps to keep innovation projects on course and in line with strategic goals (Cooper and Kleinschmidt 1995). Thus, both dimensions of OMR should have positive effects on process performance.

We further expect process performance to be positively affected by project planning. The association between these two constructs is addressed in several studies, with most of them reporting positive relationships (Dvir et al. 2003, Shenhar et al. 2002, Verworn et al. 2008). On the other hand, Poskela and Martinsuo (2009) found that project planning had no effect on process performance. They argued that the positive effects of project planning could be offset by the decreased flexibility that comes with formal planning. In this paper, however, we argue that project planning provides guidance for the realization process. Project plans grow out of intense communication processes that precede project realization activities. Team members share their existing knowledge about current customer requirements, production techniques, etc., so that plans which are developed by the project team should be more accurate in terms of cost and time targets. Furthermore, the planning process helps to clarify product conceptualization. Although the product concept may change or grow in some ways during the project realization process, project planning should help identify what is fundamental to the product concept and what can be modified.

All activities that are part of the NPD process result in higher or lower success of NPD projects, what we call project performance. Although many studies have focused on the financial aspects of project performance, in this study a customer-based non-monetary view has been chosen (Griffin and Page 1993, 1996). In the food industry retailers play a particularly important role in choosing whether to include new products into the product range offered to their customers (Menrad 2004). Thus, a customer-based project performance construct seemed more appropriate than a monetary one. In the present study project performance is high if retailers quickly incorporate new products in their assortment, if new products are able to offer advantages and if new products harmonize well with target groups.

We expect project planning to have a direct positive effect on project performance. We argue that without planning, product concepts run the risk of becoming “moving targets” (Smith and Reinertsen 1991). Large parts of the initial plan should be reflected in the innovation outcome.

Thus, comprehensive project plans directly influence the success of NPD projects. In addition to the positive effects of project planning, we also argue that process performance has a positive effect on project performance. The ability to co-operate with customers and other stakeholders during project realization and, nevertheless, being on time, should have positive effects. For instance, customer involvement should lead to more successful NPD outcomes (Cooper and Kleinschmidt 2011) because the final product is more likely to meet customer expectations, offers advantages over existing products and creates incentives to buy. Being on time, on the other hand, increases speed to market which has also been found to positively affect success (e.g. Stanko et al. 2012).

Indirect Model Relationships

The main contribution of the present paper is to demonstrate the indirect influence of senior management support, reflected in the OMR construct, on project performance and firm performance. Since the presence of indirect effects of OMR and project performance and firm performance result from significant direct relationships to and between the mediating constructs, there is no need to add further theoretical explanations for the presence of indirect relationships. In general, however, it is expected that the positive effects of OMR will show advantages in the earlier stages of the NPD process and are associated with project performance in an indirect way only. Furthermore, we also expect project performance to be the central mediator between earlier stages of NPD projects on firm performance, i.e., that project- and firm performance should be positively linked to each other while relationships between firm performance and other constructs should be non-significant.

Summary of Hypotheses

- ***H1:*** OMR and its sub-dimensions are positively related to project planning (Path 1).
- ***H2:*** OMR and its sub-dimensions are positively related to process performance and its subdimensions (Path 2).
- ***H3:*** The positive association of OMR and project performance is fully mediated through project planning and process performance (Path 4).
- ***H4:*** Project planning is positively related to process performance and its sub-dimensions (Path 3).
- ***H5:*** Project planning is positively related to project performance (Path 5).
- ***H6:*** Process performance is positively related to project performance (path 6).
- ***H7:*** Project performance is positively related to firm performance (Path 7).
- ***H8:*** Project performance fully mediates all relationships to firm performance (Paths 8, 9, 10).

Methodology

Sample

The study is based on responses to a survey among R&D managers employed in small and medium-sized food and drink companies in Germany. The developed questionnaire was based on a comprehensive literature study. In addition to the questions for the focal model constructs (see Tables 1 and 2) which were based on Likert-scales, the questionnaire contained questions dealing

with general information on the company (e.g., the branch), the situation of innovation, annual turnover, number of employees, etc. A draft version of the questionnaire has been pretested with five companies. These companies were known by the research team from previous projects. For pretesting, the draft questionnaire was electronically mailed to the company representatives (either working in R&D or in the general management) and asked for comments and suggestions for improvement. The respondents sent their comments either electronically or they were contacted by telephone. Mainly suggestions for changing the wording of single statements or questions emerged, but no clear hints were provided to significantly change the questionnaire.

After pretesting and finalizing the questionnaire, a total of 2,469 companies were contacted. Addresses were provided by food associations and also collected via databases. We mainly focused on the most important branches within the German food and drink industry (based on turnover). This included slaughterhouse and meat processing, beverage industry, confectionary, fruits and vegetables processing, the dairy industry, and fats and oil processing. The questionnaire was sent out by mail in mid-September 2007. Final responses were sent back in March 2008. The identification of SMEs was based on the questions answered concerning the number of employees. According to the definition of the European Commission (2005), companies must have less than 250 employees and an annual turnover of less than 50 million Euro per year to fall into the group of SMEs. However, since many companies did not respond to the question about annual turnover, we decided to use the number of employees as single information to categorize the companies. Sixty-eight percent of the usable returned questionnaires fell within the definition of SMEs. We ended up with 233 usable questionnaires for the main analysis. Nineteen percent of these companies had less than 20 employees, 21.8% had between 20 and 49 employees, 34.5% had between 50 and 199 employees and 24.7% employed between 200 and 250 people. With respect to the branches, the companies in the beverage industry were the largest group (28%) followed by slaughterhouse and meat processing (7%), and dairy (5%). Although a significant number (18%) did not belong to one of the predefined categories, these companies were also included in the analysis.

Evaluating Measurement Models

For the main analyses, we used Partial Least Squares – Structural Equation Modeling (PLS-SEM) to uncover direct and indirect relationships between the constructs of the model. During the analyses we closely followed the recommendations by Hair et al. (2014). Therefore, we first checked discriminant and convergent validity as well as reliability of the measurement models. Cronbach's α values as well as the composite reliability (CR) indicator showed sufficient reliability for the reflectively measured constructs (see Table 1). The average variance extracted (AVE) was greater than 0.50 and the loadings were above 0.50 for each indicator of the reflectively measured constructs. Therefore, convergent validity can be assumed. Discriminant validity was measured by the Fornell Larcker criterion (Fornell and Larcker 1981) as well as by the recently introduced heterotrait monontrait ratio of correlations (Henseler et al. 2015). Both indicators confirmed discriminant validity. For the formatively measured constructs the variance inflation factors were far below 3 (see Table 2). Therefore, a lack of discriminant validity was not an issue for these constructs. Also, all formative indicators contributed significantly ($p<0.01$) to the formation of their constructs. The measurement models and quality criterions of the model constructs are reported in Table 1 and Table 2.

Table 1. Quality Criteria of Reflective Constructs

(n=233)	CR	α	AVE	λ
Project Planning	.842	.750	.514	
1. Before an innovation project is realized all planning activities are fixed in a written document (project plan) which contains all phases of the development project.				.672**
2. In our company the target market (demand forecast, costumer needs) is planned before a new product is launched.				.800**
3. The positioning of a new product against competing products is planned in our company before a new product is launched.				.774**
4. In our company the distribution requirements and the channels of distribution are planned before a new product is launched.				.773**
Firm Performance	.840	.765	.573	
In the previous three years our company was able to:				
5. - reach a profitability above branch average.				.666**
6. - raise the productivity.				.739**
7. - raise product output.				.733**
8. - maintain or provide new jobs.				.644**
9. - stay competitive.				.791**

Note. CR: composite reliability; α: Cronbach's alpha; AVE: average variance explained; λ: loading; **: p≤.01; *: p≤.05

Table 2. Quality Criteria of Formative Constructs

(n=233)	VIF	γ
Team Resource Allocation (TRA)	1.535	
10. Specific project teams are established for innovation projects.	1.614	.491**
11. To employees who are put in charge with innovation projects time and funds are provided.	1.705	.378**
12. Employees who are put in charge with innovation projects have large room for man oeuvre and authority to decide.	1.286	.363**
Cooperation (COOP)	1.021	
13. The general management directly takes care for innovations in the company.	1.021	.425**
14. There is a close co-operation of our different departments (e.g. R&D, marketing) within the scope of an innovation project.	1.021	.846**
Process Performance	1.057	
15. We keep our time and cost targets within the product development process.	1.057	.577**
16. Ideas and reactions of customers, suppliers and experts are continuously gathered during the innovation process.	1.057	.694**
Project Performance	1.106	
17. New products contribute to an improved problem solution or better satisfaction of customers' needs compared to prior products.	1.135	.655**
18. Positioning, target group and design of the products harmonize well in most cases.	1.112	.415**
19. All trading partners quickly incorporate our new or improved products in their assortment.	1.072	.336**

Note. VIF: variance inflation factor; γ: weight; **: p≤.01; *: p≤.05

Test of Mediation Effects

Mediation (indirect) effects were tested with bootstrapping because compared to the commonly used Sobel-test, bootstrapping is a non-parametric procedure which does not assume normality of sampling distributions (Preacher and Hayes 2008). Therefore, it is best suited when PLS-SEM is applied. When testing for mediation, we followed the recommendations of Preacher and Hayes (2008) and tested a multiple mediation model without exclusion of any variable. Therefore, the results represent mediation effects that are conditional on the presence of all other mediators and as a result they should suffer less from omitted variable bias. To remain independent of distributional assumptions, we used 95% and 99% percentile bootstrap CIs to estimate significances of indirect effects.

Results

Table 3. Direct model relationships and explained variances.

Endogenous Construct	Exogenous Construct	Path	Coef. β	Std. Err.	R^2
Management (OMR)					.994
	Team Resource Allocation	0_A	.292*	.127	
	Cooperation	0_B	.782**	.110	
Project Planning					.262
	Management (OMR)	1	.512**	.053	
Process Performance					.207
	Management (OMR)	2	.257**	.075	
	Project Planning	3	.266**	.076	
Project Performance					.403
	Management (OMR)	4	.252**	.073	
	Project Planning	5	.291**	.071	
	Process Performance	6	.261**	.073	
Firm Performance					.152
	Project Performance	7	.331**	.082	
	Management (OMR)	8	.052	.093	
	Project Planning	9	-.056	.085	
	Process Performance	10	.102	.087	

Note. Path: number of path in Figure 1; **: p≤.01; *: p≤.05

The results for the direct model relationships between the model constructs are given in Table 3. These results must be interpreted very carefully because the effect sizes are estimated in the presence of all indirect effects in the model. For example, the effect of project planning on firm performance is negative in Table 3 (β_9=-.056). However, project planning is also indirectly linked to firm performance. Therefore, also the total effect must be considered when evaluating a constructs total impact (see Table 4).

The results from Table 3 show that the effect of OMR on project planning is .512 and highly significant (p<0.01). Thus, H_1 is supported. The same holds true for the relationship between

OMR and process performance whereas the path coefficients are only about half the size (β_2=.257) compared to the effects on project planning. Nevertheless, these effects are significant at p<.01, which supports H_2. Results also confirm H_4 since positive and highly significant relationships between project planning and process performance (β_3=.266) appear. Hypotheses H_5 and H_6 are also accepted as the coefficients of project planning on project performance (β_5=.291) and process performance on project performance (β_6=.261) are found to be highly significant. The positive relationship between project performance and firm performance which is posited in H_7 is also confirmed by the results of the model (β_7=.331).

Hypotheses H_3 and H_8 posit indirect (mediation) effects. Therefore, a multiple mediation analysis was conducted as described above. The results of the total, the direct and the summed indirect effects are given in Table 4[1]. The calculation of these effects is as follows: For example, for the effects of process performance on firm performance (see at the bottom of Table 4), the direct effect corresponds to results in Table 1 (Path 10), whereas small differences between results in Table 3 and Table 4 are due to the bootstrapping procedure that was applied in the multiple mediation model. Indirect effects result from the multiplication of all path coefficients that indirectly connect process performance and firm performance, i.e., coefficients of path 6 times path 7. The total effect is the sum of direct and all indirect effects[2].

Table 4. Results of the Multiple Mediation Model.

Endogenous Construct	Exogenous Construct	BT[a] mean *β*	Percentile 95% CI	
			Lower	Upper
Project Performance	*Management (OMR)*			
Total c_4'+$\Sigma_4(a_ib_i)$		.513**	.371	.634
Direct c_4'		.260**	.113	.398
Indirect $\Sigma_4(a_ib_i)$		.253**	.172	.342
Firm Performance	*Management (OMR)*			
Total c_8'+$\Sigma_8(a_ib_i)$		.239**	.087	.387
Direct c_8'		.057	-.126	.244
Indirect $\Sigma_8(a_ib_i)$		.182**	.069	.291
Firm Performance	*Project Planning*			
Total c_9'+$\Sigma_9(a_ib_i)$		.086	-.074	.241
Direct c_9'		-.060	-.222	.107
Indirect $\Sigma_9(a_ib_i)$		.146**	.072	.234
Firm Performance	*Process Performance*			
Total c_{10}'+$\Sigma_{10}(a_ib_i)$		.188*	.011	.347
Direct c_{10}'		.100	-.079	.261
Indirect $\Sigma_{10}(a_ib_i)$		.088**	.029	.159

Note. BT: bootstrapping; CI: confidence interval; **: p≤.01; *: p≤.05; indexes in formulas correspond to direct paths in Figure 1; a: bootstrapping means differ slightly from direct effects in Table 3 because of the different estimation procedures.

[1] Table 4 only contains results for which hypotheses are suggested. Single direct effects are not reported.
[2] Smart PLS version 3 calculated indirect and total effects automatically.

First, we tested whether the potential mediators together mediate the effect of OMR on project performance. Results show that the sum of indirect effects ($\Sigma_4(a_ib_i)$=.253) is highly significant, indicating that project planning and process performance together are able to mediate the effect of OMR on project performance (Preacher and Hayes 2008). However, there is also a significant direct relationship (c_4'=.260). This indicates that only about 50% of the total effect is mediated through project planning and process performance. Thus H_3 is only partially supported because full mediation was proposed. Bootstrap CIs of the individual mediation paths further show that all mediation effects of OMR on project performance are statistically significant. This indicates that every single indirect path contributes to mediating the effect. However, project planning is the most important mediator (a_1b_5 =.149, not reported in Table 4), accounting for about 60% of the indirect and about 30% of the total effect.

In H_8 it was hypothesized that project performance is the central mediator of all effects to firm performance. Direct path coefficients on firm performance are non-significant in the model (of course with the exception of project performance). The multiple mediation analyses further indicate that indirect effects account for the majorities of variances, so full mediation can be supported (Hair et al. 2014), but with the exception of process performance. For process performance less than 50% of the total effect (c_{10}'+$\Sigma_{10}(a_ib_i)$=.188) is mediated through project performance. Thus, although the direct effect is non-significant in all models, the mediation analyses show that project performance only partially mediates the effect of process performance on firm performance. Thus H_8 is only partially supported.

Discussion and Conclusion

The purpose of this study was to demonstrate that the decisions, behaviour and rules applied by senior management do not (only) influence NPD success and firm performance directly, as suggested by many previous studies, but mainly indirectly through antecedents of project performance and firm performance. To test these assumptions a PLS structural equation model was applied in order to reveal the direct effects as well as the mediated effects of senior management support on the final dependent variables, namely project performance and firm performance.

As hypothesized in H_1 and H_2, the direct effects of OMR on project planning and on process performance were positive and statistically significant. However, the effect on project planning was about two times larger than the effect on process performance. Decisions of senior management seem to have an impact especially at the beginning of an NPD project. This is in accordance with the results of other studies which also found senior management participation to be very important in the early stages (Poskela and Martinsuo 2009). However, project planning and process performance seem not to be the only factors that mediate the effects of OMR on project performance since only about 50% of the total OMR effect on project performance was mediated. The same results were found for the effects of process performance on firm performance. We expected full mediation through project performance, but the multiple mediation model revealed only partial mediation. One reason could be that our model constitutes a great simplification of real-world processes so that non-salient factors are represented in unexpected direct effects. Additionally, process and project performance are operationalized as formative constructs with limited numbers of sub-dimensions. Project performance, for example,

only consists of non-monetary dimensions that seem unable to fully mediate all effects on firm performance.

In general, however, the results of this study clearly demonstrate that the decisions and behaviours of senior management in promoting innovation are omnipresent and have a major influence on the outcome of NPD projects, especially in indirect ways. The results confirm some findings from previous studies. In particular, confirming that senior management support and knowledge-transfer between functions are important drivers of NPD performance. The present study further highlights that indirect effects play prominent roles in explaining the influences on project performance. Project planning and process performance do not only have direct effects on project performance, but also serve as important mediators between senior management support and project as well as firm performance. Results, however, indicate that further factors should exist which mediate the effects of managerial behaviour on NPD performance. One example for such a neglected factor is decision making clarity (Schultz et al. 2013) which for sure is important in any phase of NPD-projects, but was not considered in the present study.

Results further indicate that there are positive effects when senior managers directly take care of NPD projects and foster cross-functional communication and cooperation. Even in small firms, personal animosities can arise and endanger the success of innovation projects. Managers can ensure that motivation to achieve shared project goals and adherence to normal good manners will prevail against individual ambition and any disruptive behaviour. Employees can be motivated by the allocation of time, money and decision-making autonomy. Although other studies have argued that autonomy, for example, could lead to confusion and uncertainty among team members, in this study the positive effects were found to outweigh the negative. The encouragement of autonomous decision-making in project teams together with the awareness that senior management is actively involved can help to motivate higher performance levels.

In summary, senior management has supervisory control of all activities in SMEs. It is up to senior management to decide the way in which NPD projects are conducted, how much formal control is implemented, which resources are allocated to employees and innovation teams as well as the extent with which management itself is actively involved in innovation activities and NPD projects. However, the results of this study clearly indicate the beneficial effects of both, the generous allocation of resources and the active participation of management in fostering good communication and cooperation.

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Appendix

Robustness Checks

Some model constructs in this study were conceptualized as formative constructs. This decision was based on theoretical assumptions. For example, Jarvis et al. (2003) criticized that constructs are often measured reflectively although they should have been measured formatively from a theoretical standpoint. On the other hand, formative constructs are not free of criticism itself (e.g., Edwards 2011). In order to address some of these critics, we tested our model by constraining the indicator weights. For formatively measured constructs, all of them were fixed to contribute the same amount to the constructs they made up (McDonald 1996). Additionally, the path coefficients of TRA and COOP were fixed to a contribution of 50% to OMR. Since the indicator weights could not be freely estimated in the restricted model, it was assumed that the path coefficients are lower compared to an unrestricted model. However, the differences in the path coefficients were only marginal and the restricted model led to the same conclusions as the unrestricted model. Therefore, the model results can be considered robust against the use of formative constructs.

We also tested the influence of common method variance (CMV). CMV refers to variance attributable to the measurement method rather than to the construct of interest (Bagozzi et al. 1991, Podsakoff et al. 2003). CMV could result in biased estimates, known as common method bias (CMB). As survey data are used, CMV and CMB could be a serious problem. Therefore, we checked for CMV and CMB after data collection applying a procedure suggested by Rönkkö and Ylitalo (2011). Results of these tests allowed us to conclude that no serious biasing effects were present.

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Market Intermediaries' Ratings of Importance for Rosaceous Fruits' Quality Attributes

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Abstract

We elicited market intermediaries' (i.e., shippers, packers, marketers) preferences for various fruit quality traits in apples, peaches, strawberries, and cherries in terms of ratings of importance, and identify factors significantly influencing these ratings. In general, results indicate that market intermediaries rate fruit quality traits associated with U.S. grade standards and consumer acceptability as most important. Information about preferred quality traits and factors influencing those preferences should increase the efficiency of developing improved fruit cultivars that appeal to the whole supply chain. Improved cultivars should enhance the ability of breeders, growers, and market intermediaries to supply high-quality fruit that better satisfy consumer demand.

Keywords: fruit quality traits, ordered probit model, rosaceous crop

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Introduction

The Rosaceae family includes fruits (apples, apricots, plums, cherries, peaches, pears, raspberries, strawberries), nuts (almonds), and ornamentals (roses). The Rosaceae family contributes to improved human health and well being. However, with the exception of strawberry, domestic consumption of some rosaceous fruits has stagnated or even decreased over the past decade. Between 2000 and 2012, annual per capita consumption of strawberries increased from 4.9 to 7.8 lbs., while peach consumption decreased from 5.3 to 3.9 lbs. and apple consumption slightly decreased from 17.6 to 16.1 lbs. (USDA-ERS 2014).

This overall downward trend challenges the industry's long-term sustainability (Iezzoni et al. 2010). Overcoming these challenges requires efficient development and rapid adoption of new cultivars with improved fruit quality traits. Identifying traits with maximum value to the entire supply chain is a difficult task, as supply chain members have divergent views on the importance of different plant and fruit quality traits. For example, the trait of highest importance to growers could be disease resistance, while packers might be most concerned with avoiding storage disorders, and consumers might prefer the most flavorful fruits. Market-based information concerning the importance of different traits from the various participants along the supply chain is critical in understanding and reconciling these divergent viewpoints.

This research is part of a project called RosBREED: Enabling Marker Assisted Breeding in Rosaceae. The goal of this project is to increase the efficiency of rosaceous breeding programs by applying DNA-based information to improve the probability of delivering successful cultivars. One objective of RosBREED is to study the marginal value and relative importance of targeted plant and fruit quality traits among growers, intermediaries, and consumers.

The study reported on here specifically assesses the ratings of importance that market intermediaries assign to targeted fruit quality traits. Intermediaries—defined in this study to include shippers, packers, marketers, and processors—play an important role in the fruit supply chain. They contact growers to receive, clean, sort, and store fruit; impact buying and selling prices; and establish transactions with wholesalers and retailers (Spulber 1996). Through these activities, they add value to the fruit crops being handled. In 2008, market intermediaries accounted for added 26.1 cents of value for each retail food dollar expenditure, implying that for every dollar consumers paid for food at retail, 26.1 cents was to pay for packing, shipping, and processing (U.S. Department of Agriculture 2013).

The objectives of this study are threefold. First, we assess how market intermediaries rate the relative importance of selected fruit quality traits for apples, peaches, strawberries, and cherries. Second, we estimate firm-related factors influencing these ratings. Third, we compare intermediaries' ratings with preferences of breeders, growers and consumers. The results of this study provide useful information to market intermediaries for planning purposes, to breeders for setting priorities focusing on fruit quality traits of maximum importance to the supply chain, and to growers for making decisions about planting new cultivars. This study is related to the study conducted by Gallardo et al. (2014), in which willingness-to-pay (WTP) values for targeted fruit quality traits were elicited using discrete choice experiments from the same market intermediaries studied here.

Literature Review

While studies have been conducted for some of the Rosaceae crops of interest in this research, very limited research has been done to elicit growers' and market intermediaries' preferences for fruit quality traits. Most preference studies for apple, peach, strawberry, and cherry fruit quality traits have been undertaken from the consumer perspective.

Various studies of apple growers, market intermediaries, and consumers have shown various preferences for quality traits. Yue et al. (2013) found that U.S. fresh apple growers ranked fruit flavor as the most important fruit quality trait, followed by fruit crispness, firmness, shelf life at retail, and fruit juiciness, all relative to the importance of disease resistance. Gallardo et al. (2014) found that U.S. fresh apple market intermediaries were willing to pay price premiums to improve shelf life, external appearance, firmness, flavor, and crispness. Consumer preferences have been studied in considerable detail. Researchers have found that consumers value various apple traits such as crispness, size, color, sweetness, firmness, appearance, origin, and flavor or taste (Manalo 1990, Daillant- Spinnler et al. 1996, Jesionkowska et al. 2006, McCluskey et al. 2007, Dinis et al. 2011, Yue and Tong 2011, McCluskey et al. 2013).

For sweet cherries, Yue et al. (2014a) found that U.S. growers feel that fruit size, followed by flavor, firmness, freedom from pitting, and powdery mildew resistance are more important when compared to viral disease resistance. Gallardo et al. (2014) calculated that fresh sweet cherry market intermediaries were willing to pay a price premium for an increase in soluble solids content (SSC) -a measure for sweetness-, flavor, external color, size, and firmness. Studies of consumer preferences have identified taste, freshness, color, shape/size, sweetness, flavor, firmness, uniformity, glossiness, flavor intensity, acidity, and SSC:acid ratio as important quality traits (Miller et al. 1986, Guyer et al. 1993, Dever et al. 1996, Wermund et al. 2001, Crisosto et al. 2003, Hu 2007). Kappel et al. (1996) estimated that the optimal size for sweet cherries was 29–30 mm diameter, minimum SSC was between 17–19%, and optimum acidity expressed in pH units was 3.8.

U.S. fresh peach growers place a higher importance on traits such as fruit flavor and size when compared to disease resistance, whereas fruit skin color and shape are less important than disease resistance (Yue et al. 2014b). Park and Florkowski (2003) found that U.S. peach growers valued fruit taste, texture, pit characteristics (absence of split pit and pit that does not separate from the fruit), but absence of decay and bruising were the most important fruit traits when deciding cultivar selection. Gallardo et al. (2014) estimated that peach market intermediaries in California were willing to pay a price premium to increase SSC and firmness. Peach market intermediary operations not in California were willing to pay for improved size, firmness, SSC, and external color. Among consumers, various studies have determined that fruit quality traits, including freedom from defects, color, maturity, size, high SSC, acidity, astringency, and sweetness are positively correlated with fresh peach retail prices or consumers' overall acceptance of fruit (Jordan et al. 1987, Parker et al. 1991, Ravaglia et al. 1996, Predieri 2006).

U.S. strawberry growers rated fruit traits such as flavor, firmness, shelf life at retail, external color, and size and plant traits such as open plant canopy, extended harvest seasons higher than root rot resistance (Yue et al. 2014c). Gallardo et al. (2014) estimated that market intermediaries

in the U.S. were willing to pay price premiums to improve fruit flavor, firmness, and size. Among consumers, fruit flavor, sweetness, juiciness, freshness, taste, firmness, fruit color, and fruit size, and complex flavors have been identified as important strawberry traits (Ford et al. 1996, Safley et al. 1999, Keutgen and Pawelzik 2007, Lado et al. 2010, Colquhoun et al. 2012). In general, studies indicate that growers' and market intermediaries' preferences for fruit quality traits are partially aligned with consumers' preferences. Consumers in general prefer fruit with superior flavor (e.g., sweetness and acidity), texture (e.g., flesh firmness and crispness), and appearance (e.g., external color and size). To our knowledge, except for Gallardo et al. (2014), no other studies have investigated market intermediaries' perspectives on the importance of fruit quality traits. Gallardo et al. (2014) estimate intermediaries' willingness-to-pay for a subgroup of fruit quality traits by using a discrete choice experiment. The current study focuses on intermediaries' ratings of importance of a larger set of attributes and does not focus solely on the values of attributes, although most respondents likely consider values of attributes as they rate their importance. This study also adds to the understanding at which market intermediaries share breeders', growers', and consumers' preferences. This study only focuses on fresh market products –economically the most important portion of Rosaceae fruit crops.

While Gallardo et al. (2014) estimates intermediaries' willingness-to-pay for six fruit quality traits by using a discrete choice experiment, this study focuses on intermediaries' ratings of importance (from 1=extremely unimportant to 7=extremely important) assigned to a larger (e.g., fifteen) set of fruit quality traits. The inclusion of a large set of traits in the choice experiment would require a large number of choice scenarios, which could potentially lead to respondents' fatigue and affect the response rate and the reliability of the responses (Carson et al. 1994, Hauser et al. 2004, Savage and Waldman 2008). This is not the case when eliciting ratings of importance, as the Likert scale enables the inclusion of a larger number of traits when respondents only consider one trait at a time. Also, this study illuminates on the differences obtained from two types of questions typically used to elicit preferences: ratings versus choice. When asked to rate importance, respondents do not associate cost with their preferences. This is reflected in the respondents' tendency to assign a high importance to quality traits that perhaps would not be as important when preferences are associated with a cost.

Methodology

The data used in this study were collected through a series of crop specific surveys created in consultation with scientists and industry representatives for each crop to ensure the language used was easy for survey respondents to understand. A total of five versions of the survey were used and each version targeted one fruit and was sent to market intermediaries for that specific fruit. The five market intermediary groups included those for; (1) fresh apple, (2) fresh peach handled by intermediaries located in the state of California, (3) fresh peach handled by intermediaries not located in California, (4) fresh sweet cherries, and (5) fresh strawberries.

The survey sample consists of shippers, packers, brokers, processors, and other market intermediaries for each crop. The sample was built using several information sources, including the Blue Book Online Services (a credit and marketing information agency serving the international wholesale produce industry), Washington State Tree Fruit Association, Cherry Marketing Institute, and Yakima Valley Growers' and Shippers' Association. A mixed mode

method (a combination of mail and internet survey, in which the market intermediary could select which way they wanted to respond to the survey) was used to distribute the survey. The mailing sequence (survey, reminder postcard, survey) took place from April to August 2011. The survey package included a cover letter, applicable letter of support (depending upon the fruit crop, a letter of support from industry representatives was included to encourage response), questionnaire, postage-paid return envelope, and a $4 pre-incentive. Of the total 720 surveys sent, 155 completed surveys were received (109 through the mail and 46 via the internet), representing an overall response rate of 22%. Table 1 lists the initial number of surveys sent, the number of completed responses received by mail and online, total and for each crop included in the study.

Table 1. Marketing intermediaries' survey: Initial sample sent, states represented, and response rate by crop.

Fruit	Initial sample	States represented	Number of responses		
			Mail	Online	Total
Fresh apple	146	WA, NY, CA, MI, PA, NC, VA, OH, OR	27	12	39
Fresh peach in California	132	CA	15	12	27
Fresh peach not in California	161	NJ, PA, OR, SC, GA, CO, WA, FL, IL, MA, MI, NY, TX, AZ, AL	30	6	36
Fresh sweet cherry	97	WA, CA, OR, ID, UT	22	9	31
Fresh strawberry	184	CA, FL, NC, OR, WA	15	7	22
Total	720		109	46	155

The survey requested that the respondent be the owner or manager of the market intermediary operation with final responsibility for making marketing management decisions. Each survey consisted of seven sections. Section one included questions about facility characteristics (e.g., year of establishment, number of employees, sales volume corresponding to a specific function, and fruit crops handled). Section two included questions about the importance of various fruit quality traits to the business. The list of traits was tailored to each fruit crop. To capture market intermediaries' ratings for different traits we used a seven-point Likert scale (1=extremely unimportant, …, 7=extremely important). Section three included questions about the importance of plant traits to the business and the importance of supply chain members when rating fruit quality and plant traits. Section four included questions related to the availability of new fruit cultivars, including rating the importance of supply chain members when deciding to include a new fruit cultivar in the business portfolio. Sections five and six included questions about the operation's relationship with customers and suppliers. Section seven included questions regarding the use of contracts, quality and product standards enforced by the market intermediary operation, volume of total sales in dollars, and the size of the operation.

There were several survey questions that respondents failed to answer. The simplest way to handle would have been to discard incomplete information and just analyze the complete responses. However, this could lead to biased and inefficient estimations (Allison 2002). Therefore, we used multiple imputation to generate a set of plausible estimates for each missing

value. We followed the procedure in Enders (2010). First, when a variable has missing observations q times, q (for q >1) distinct values following a multivariate normal distribution and based on the existing observations are generated for the variable. Then, the q complete data sets are analyzed using a regression analysis. The analysis is performed q times, once for each filled-in imputed data set thus we get q sets of results. Next, the results from the q complete data sets are combined to produce a final single set of parameter estimates. The potential pitfall of multiple imputation is that the probability distribution used to generate the missing values is at best only approximately true. However, previous research has demonstrated that the technique outperforms (the alternative of discarding incomplete information) in case of departures from the assumed distribution used in the imputation model (Rubin 1996).

Empirical Specification

Likert scales were used to measure the importance (ratings) that market intermediaries assigned to different fruit quality traits. Likert scales are widely used in marketing research given their simplicity to use and the reliability of the results (Likert 1932, Adams et al. 1965). Reliability of results is typically a function of the number of response categories (Cox 1980, Preston and Colman 2000), the inclusion of a neutral category (Guy and Norvell 1977, Garland 1991), cultural differences across respondents (Flaskerud 1988, Lee et al. 2002), experimental design (Churchill and Peter 1984), and statistical techniques (Clason and Dormody 1994) used to analyze scale-derived data.

An ordered discrete choice regression (m) was used separately for each fruit crop, differentiated by geographic location. In each fruit crop regression (m = fresh apple, sweet cherry, fresh peach in California, fresh peach not in California, and fresh strawberry), the dependent variable was a set of ordered discrete values using the seven-point Likert scale (1=very unimportant, …, 7=extremely important) from the survey. These numbers have a natural ordering but no cardinal significance. That is, the number for the rating is meaningful in terms of the ordering of the outcomes, but the numeric differences are not meaningful. The dependent variable was a set of stacked ratings for all quality traits relevant to the fruit crop. Data were tabulated such that one fruit quality trait generated seven observations, each observation corresponding to the 7 points in the Likert scale.

To analyze market intermediaries' ratings for each fruit quality trait, we used a multivariate ordinal probit model (Greene and Hensher 2010):

$$
\begin{aligned}
& y_{im}^{*} = \beta_m x_{im} + \varepsilon_{im}, \\
(1) \quad & y_{im} = j_m \text{ if and only if } \mu_{j_m-1} < y_{im}^{*} \leq \mu_{j_m}, \\
& i = 1, \ldots, I, j_m = 1, \ldots, J_m
\end{aligned}
$$

where i is an index for observations; m is an index for equations in the system (m= fresh apple, sweet cherry, fresh peach in California, fresh peach not in California, and fresh strawberry); j_m is an index for categories in equation m (j_m = extremely unimportant, very unimportant, unimportant, neutral, important, very important, extremely important); J_m are the total number of categories in equation m (J_m=7); y_{im}^{*} is an unobserved ordered-response or latent variable; $y_{im}$is an observed ordered-response variable ($y_{im} = 1, \ldots, 7$); μ_{j_m-1} is the lower bound for discrete

level j_m and $\mu_{j_m}$is the upper bound, $x_{im}$is a vector of independent variables, including fruit quality traits and firm-specific characteristics; $\beta_m$is a vector of the parameters to estimate; and ε_{im} is the random error term, which is assumed to be distributed independent and identical across observations.

In the ordered probit model, the parameter, β'_m, is the marginal change in unobserved latent variable y^*_{im} due to a change in x_{im}, everything else constant. However, the interest usually is in the changes in the observed dependent variables, y_{im}. These changes involve considering probabilities. Specifically the probability that y_{im} equals j_m is given by

$$(2)\quad Prob(y_{im} = j_m|x_{im}) = \Phi\left(\mu_{j_m} - \beta'_m x_{im}\right) - \Phi(\mu_{j_m-1} - \beta'_m x_{im}),$$

where Φ is a univariate standard normal distribution (Cameron and Trivedi, 2005).

The marginal effects are then calculated by:

$$(3)\quad \frac{\partial Prob(y_{im}=j_m|x_{im})}{\partial x_{im}} = [\phi\left(\mu_{j_m-1} - \beta'_m x_{im}\right) - \phi\left(\mu_{j_m} - \beta'_m x_{im}\right)]\beta'_m$$

where $\phi(x) = \frac{\delta\Phi'(x)}{\partial x}$ (Cameron and Trivedi 2005). Equation (3) emphasizes that the effect of a

change in a single x_{im} is impacted by all parameters and data used in the model, and varies by the probability levels j.

In this study, the explanatory variables included a set of binary variables for each fruit quality trait. A binary variable was equal to 1 if the fruit quality trait was given the rating corresponding to the rating in the dependent variable and 0 otherwise. To avoid perfect multicollinearity due to inclusion of redundant information, the fruit quality trait variable of phytonutrient content (e.g., vitamins, antioxidants) was omitted across all crops for estimation purposes only. Thus, the variable phytonutrient content serves as the reference for interpretation of the estimated coefficients of the rest of binary variables. Since ratings close to 7 suggest more important traits, a positive and statistically significant coefficient indicates that the fruit quality trait is more important than phytonutrient content. The value of the coefficient indicates the difference in importance for each trait relative to the importance of the phytonutrient content.

In addition, the set of explanatory variables included variables referring to the characteristics of the market intermediary operation. Including all these variables could potentially result in a high level of multicollinearity (due to high correlation of the variables), a subset of market intermediary operations' characteristics was selected for inclusion for each fruit crop. These were identified using linkage criteria based on variable clusters and principal component and factor-analysis-based algorithms (Johnson and Winchern 2007). The market intermediary operation could have multiple functions, such as shipping or handling the fruit as packers. To control for such effects, the variables measuring the percentage of total sales volume sold when the operation acted, as packer and percentage of total sales volume for shipper were included. Since the market intermediary operation could handle more than one fruit, we also included the variables measuring the percentage of total sales volume for each fruit (i.e., apple, peach,

strawberry, and cherry). In addition, binary variables for brokers and repackers were included to control for differences in response when the market intermediary operation did not sell directly to the retailer but to other intermediaries. To investigate whether consumers' opinions mattered to intermediaries, the discrete variable rating for importance (1=very unimportant, …, 7=extremely important) assigned to consumers' preferences was included. Finally, facility size as viewed by the respondent was included. To control for the different data collection methods, i.e., a mail and an online survey, we included a binary variable representing the survey mode and it equals 1 if the survey was conducted online and 0 otherwise. Past research has shown that the mode of administration can have an effect on the data collected. Nonetheless, differences between mail and online survey responses are shown to be minimal as both are self-administered. Both have great cognitive burden, high recall and social desirability bias, low "yes-saying" bias and high unwillingness to disclose sensitive information. Differences stem in that online surveys have lower population coverage for sampling, response rates, and question order effects compared to mail surveys (Bowling 2005).

The specification of equation (1) for each crop is as follows. For fresh apples, the set of independent variables included external appearance, internal appearance, shelf life at retail, crispness, firmness, storage life, external color, flavor, size, juiciness, sweetness, shape, tartness, aroma, firm's year of establishment, percentage of total sales volume handled as shipper, percentage of apples handled by the firm, discrete variable for importance of consumers' preferences, binary variable for firm sells to repackers, firm size, and survey mode. For the sweet cherry equation, the set of independent variables included size, firmness, external appearance, storage life, shelf life at retail, stem attractiveness, flavor, sweetness, tartness, shape, internal color, percentage of fruit handled as packer, percentage of cherries handled by the firm, discrete variable for importance of consumers' preferences, binary variable if firm sells to broker, firm size, and survey mode. For the fresh peach in California and not in California equations, the independent variables included flavor, external appearance, external color, absence of split pit, sweetness, size, storage life, firmness, aroma, shape, internal color, tartness, firm's year of establishment, percentage of fruit handled as shipper, percentage of peaches handled by the firm, discrete variable for importance of consumers' preferences, binary variable for firm sells to repackers, firm size, and survey mode. Finally, for the fresh strawberry equation, the set of independent variables included external appearance, flavor, external color, seediness, absence of cap, seed color, internal color, sweetness, shape, size, firmness, shelf life, juice color, tartness, drip loss, continuous variable for firm's year of establishment, percentage of fruit handled as shipper, percentage of fruit handled as packer, discrete variable for importance of consumers' preferences, binary variable for firm sells to repackers, firm size, and survey mode.

Results

Summary statistics of the characteristics of the facilities surveyed are listed in Table 2. In general, operations handling fresh apples had more years in business compared to the other crops. Operations handling fresh sweet cherries had more permanent and seasonal employees compared to the other crops. Most facilities (72%) handling fresh apples sold the bulk of their fruit regionally and nationally. Most facilities (57%) located in California handling fresh peaches sold nationally, whereas facilities (47%) not in California handling fresh peaches sold regionally. Fifty three percent of the facilities handling sweet cherries, and 48% handling fresh strawberries,

sold nationally. In general, across crops, facilities procured their fruit within 100 miles. Most fresh apple (59%) and strawberry (61%) facilities considered themselves medium sized, fresh peach facilities located in California were both small (39%) and medium sized (39%), fresh peach facilities not in California (63%) and fresh sweet cherries (43%) considered themselves as small sized. The average ratings assigned to each fruit quality attribute are reported in Table 3. For apples, external appearance was the attribute with the highest mean rating, for sweet cherries it was size, for all peaches it was flavor, and for sweet cherries it was external color.

Table 2. Summary statistics of characteristics of market intermediaries' firms for each crop surveyed.

	Fresh apple	Fresh peach in California	Fresh peach not in California	Fresh sweet cherry	Fresh strawberry
Average number of years since the facility was established (base year 2015)					
Years	52	33	47	43	27
Average number of employees in 2010					
Permanent	122	50	24	167	19
Seasonal	287	355	182	997	200
Percentage of firms by geographic area where the majority of the fruit was sold in 2010					
Within 100 miles	10%	10%	19%	16%	44%
Regional but not national	36%	4%	47%	9%	4%
National	36%	57%	31%	53%	48%
International	18%	29%	3%	22%	4%
Percentage of firms by geographic area where the majority of the fruit was procured in 2010					
Within 100 miles	72%	61%	66%	69%	65%
Regional but not national	25%	26%	13%	25%	22%
National	0%	7%	16%	6%	13%
International	3%	6%	5%	0%	0%
Percentage of firms that considered their business small, medium, or large sized in 2010					
Small	23%	39%	63%	43%	26%
Medium	59%	39%	35%	27%	61%
Large	18%	22%	6%	29%	13%

The ordered probit parameter estimates and marginal effects for market intermediaries' ratings of importance for selected fruit quality traits by crop are presented in Tables 4–8. Table 9 provides a comparison of the top five quality traits to breeders, growers, intermediaries, and consumers. Information for breeders, growers, and market intermediaries comes from previous studies, which are part of the overall RosBREED project. Information on consumers' preferences was obtained from other studies not related to RosBREED.

Apples

Fresh apple market intermediaries consider fruit external appearance, internal appearance, shelf life at retail, crispness, firmness, storage life, external color, flavor, size, juiciness, sweetness, and shape as more important than phytonutrient content. The marginal effect results for the observed dependent variable indicates that the probability that external appearance was rated 7 or extremely important was 34.1% higher than phytonutrient content. Following external appearance, in importance, the highest rated traits were internal appearance with 34%, shelf life at retail 32.4%, crispness 32%, and firmness 31.4% higher probability of the attribute being rated 7 compared to phytonutrient content (Table 4, see Appendix).

External appearance is a criterion for the U.S. grade standards for apples (U.S. Department of Agriculture 2002), which, in part, impacts apple market prices and potentially affects intermediaries' profitability. Poor internal appearance includes the various types of internal browning disorders that could affect final packouts if detected during storage, or consumer satisfaction and hence repeat purchases if not detected in packing. Improved shelf life at retail will decrease the probability of fruit losses due to spoilage, and could result in an increase in intermediaries' profitability. Market intermediaries rated fruit texture traits such as crispness and firmness followed by flavor higher than phytonutrient content. These eating quality traits are important determinants of consumer acceptance of the fruit. Preserving fruit quality traits during storage and controlling storage length improves market intermediaries' negotiating power with retailers (Tronstad et al. 1992, Carew 2000). Advances in storage technologies (e.g., controlled atmosphere, 1-methylcyclopropene) have made apples of desirable quality available year round (Fan et al. 1999, Watkins et al. 2000). However, the genetic variation among cultivars makes them respond differently to storage technologies (Calderon-Lopez et al. 2005). Similar to external appearance, fruit external color, size, and shape are also criteria for the U.S. grade standards for apples (USDA 2002).

Among the firm characteristics included in the model, the percentage of total sales volume handled as shipper had a negative effect on assigning ratings extremely important to fruit quality traits. Conversely, firms with higher percentages of apples handled gave the highest ratings of importance to fruit quality traits and to consumer preferences. Firm size did not significantly impact the intermediaries' assigning ratings to traits. In relation to the survey mode used, firms responding to the survey online, on average, assigned lower ratings to fruit quality traits compared to firms responding via mail.

Preferences among apple market intermediaries are partially aligned with traits preferred by U.S. apple breeding programs, since crispness and shelf life were rated as extremely important by breeders and had a probability higher than 87% of being selected in new cultivar development (Yue et al. 2012, Gallardo et al. 2012). Results for market intermediaries are comparable to ratings of importance assigned by apple growers, who rated fruit flavor as the most important quality trait, followed by fruit crispness, firmness, shelf life at retail, and juiciness, compared to disease resistance (Yue et al. 2013). Results are also partially aligned with consumers' preferences (Table 9). Existing literature for consumers indicate that improved texture (i.e., crispness, firmness), flavor (i.e., sweetness, tartness) and appearance (i.e., size, external color, external appearance) traits positively impact acceptance of apples (Manalo 1990, Daillant-Spinnler et al. 1996, Jesionkowska et al. 2006, McCluskey et al. 2007, Yue and Tong 2011, McCluskey et al. 2013).

Cherries

Market intermediaries rated sweet cherry fruit size, firmness, external appearance, storage life, shelf life at retail, stem attractiveness, flavor, and sweetness, as higher in importance compared to phytonutrient content. The marginal effect results show that the probability that size was rated 7 was 38.4% higher compared to phytonutrient content. Following size in importance, the highest rated traits were firmness with 32.7%, external appearance 30.5%, storage life 26.6%, and shelf life at retail 25.9% higher probability of the attribute being rated 7 compared to phytonutrient content (Table 5, see Appendix).

Fruit size has become a dominant quality attribute in the sweet cherry industry. Hinman and Hoheisel (2007) observed that larger fruit (more than one inch in diameter) could earn 50 cents or more per pound than smaller fruit at the FOB level. In addition, external appearance, size, and firmness are traits included in the U.S. grade standards for sweet cherries (U.S. Department of Agriculture 2005), which impacts market prices. Improved storage and shelf life at the retail impact intermediaries' profitability in a positive way, through a reduction in product loss. Sweet cherry fruits deteriorate rapidly due to moisture loss, color change, softening, surface pitting, stem browning, and loss of acidity (Serrano et al. 2005) and consequently have a shorter marketing window with lower lengths of storability and shelf life, compared to other crops such as apples. Additionally, operations that place a higher importance on consumers' preferences, sell to brokers, and consider themselves to be a large business tend to give higher ratings of importance to fruit quality traits.

Sweet cherry breeders signaled that fruit firmness and size were the traits that had the highest probability of being included in selections (100% probability) for new cultivar development (Yue et al. 2012, Gallardo et al. 2012). Growers considered fruit size, followed by fruit flavor, fruit firmness, freedom from pitting, and powdery mildew resistance as more important than viral disease resistance in their decisions to grow a specific cultivar (Yue et al. 2014a). Intermediaries and growers rate size higher in importance than sweetness and flavor, but intermediaries indicated that they would pay more for sweetness and flavor compared to size. Improved fruit flavor and sweetness are important eating quality traits for consumer acceptance. Hu (2007) concluded that consumers were willing to pay premium prices for improved sweet cherry sweetness (Table 9, see Appendix).

Peaches

Intermediaries for the fresh peach market in California rated fruit flavor, external appearance, external color, shelf life, sweetness, absence of split pit, size, storage life, firmness, and aroma, as more important than phytonutrient content. The marginal effect results show that the probability that flavor was rated 7 or extremely important, was 23.9% higher compared to phytonutrient content. Following flavor in importance, the highest rated traits were external appearance with 19%, external color 18.4%, shelf life 15.7%, and absence of split pit and sweetness, both with 14.4% higher probability of the attribute being rated 7 compared to phytonutrient content (Table 6, see Appendix).

Intermediaries for peaches not in California rated fruit flavor, size, external appearance, absence of split, external color, sweetness, firmness, shelf life, shape, and storage life, as more important than phytonutrient content. The marginal effects results show that the probability that flavor was rated 7 was 30.1% higher compared to phytonutrient content. Following flavor in importance, the highest rated traits were size with 28.4%, external appearance with 26.9%, absence of split pit 26.6%, and external color 25.6% higher probability of the attribute being rated 7 compared to phytonutrient content (Table 7, see Appendix).

Intermediaries both in and outside California placed a high importance on eating quality traits such as flavor followed by appearance traits (external appearance, external color, and size). The latter are part of the U.S. grade standards for peaches (USDA 2004). Market intermediaries in California who considered consumer preferences important and who sold to repackers tended to provide high ratings of importance, whereas firms who consider themselves as large in size tended to provide lower ratings of importance to traits. Also, fresh peach intermediaries in California who responded to the survey online tended to assign higher ratings of importance to fruit quality attributes compared to firms who responded via mail. Market intermediaries not in California who considered consumer preferences important and who were large in size tended to assign higher ratings of importance. Firms that handled a lower percentage of peaches tended to assign lower ratings to fruit traits.

We observed consistency in comparing these results to U.S. peach breeding programs' targets, as fruit firmness and fruit size were rated as extremely important and highly likely (probability higher than 87%) to be included in breeding programs (Yue et al. 2012, Gallardo et al. 2012). In addition, the results are aligned with Yue et al. (2014b) who found that growers not in California felt that fruit flavor and size were more important compared to disease resistance. Also, results are partially aligned with findings from consumer studies in that freedom from defects, color, maturity, size, high SSC, acidity, astringency, and sweetness were positively correlated with fresh peach retail prices or consumers' overall acceptance of fruit (Jordan et al. 1987, Parker et al. 1991, Ravaglia et al. 1996, Predieri 2006) (Table 9, see Appendix).

Strawberries

Fresh strawberry market intermediaries rated external appearance, flavor, and external color as more important than phytonutrient content. The marginal effect results show that the probability that external appearance was rated 7 or extremely important was 14.3% higher compared to phytonutrient content. Following external appearance in importance, the highest rated traits were flavor with 13.6% and external color with 13.1% higher probability of the attribute being rated 7 compared to phytonutrient content (Table 8, see Appendix). Seediness, absence of cap, and seed color were less important than phytonutrient content. The marginal effect results show that the probability that seediness was rated 7 was 12.6% lower compared to phytonutrient content, and absence of cap was 17.9% and seed color was 17.8% lower probability than phytonutrient content being rated 7.

Consistent with other crops, strawberry intermediaries signal that traits associated with the U.S. grade standards and eating quality are the most important for their operations. External appearance and external color (as well as firmness and size) are traits considered in the U.S.

grade standards for strawberries, which partially determine market prices and thus impact intermediaries' profitability (USDA 2006). Strawberry operations handling fruit as shippers, operations that assigned higher ratings of importance to consumer preferences, and operations that considered themselves large in size tended to assign higher ratings of importance to quality traits presented in the survey. Firms selling to repackers assigned lower ratings to these quality traits. Firms responding to the survey online assigned higher ratings of importance to fruit quality attributes compared to firms who responded via mail.

U.S. strawberry breeders' current breeding targets are consistent with market intermediaries' ratings of importance, as flavor, shelf life, size, and external color were quality traits likely (probability higher than 89%) to be included in the new selections for cultivar commercialization (Yue et al. 2012, Gallardo et al. 2012). Growers rated fruit flavor as the most important trait, followed by fruit firmness, shelf life at retail, open plant canopy, external color, extended harvest season, and fruit size compared to root rot resistance (Yue et al. 2014c) (Table 9, see Appendix). Consumer preference studies for strawberries have cited flavor, sweetness, firmness, and juiciness as the most important quality traits (Ford et al. 1996, Keutgen and Pawelzik 2007, Lado et al. 2010, Colquhoun et al. 2012).

Discussion

For all fruit crops considered in this study, market intermediaries consistently rated fruit quality traits associated with U.S. grade standards (size, external appearance, external color) and eating quality characteristics (flavor, sweetness, crispness, firmness) as highly important. Traits such as shelf life at retail and storage, when applicable, were also rated high in importance. Compared to previous literature, these preferences appear to be aligned with preferences reported for breeding programs, growers, and consumers, using a consistent methodology for all levels of the supply chain. Note that the probability of inclusion for these desirable traits in breeding programs is rather high (> 87%). Recent advancements in breeding techniques such as the use of DNA markers are making this feasible (Iezzoni et al. 2010).

Despite the fundamental differences between the Likert scale ratings of importance used in this study (which does not force survey respondents to make choices across traits) and the choice experiment in Gallardo et al. (2014), one would expect the results of the two studies to be partially aligned. For fresh apples, external appearance was the fruit quality attribute rated most consistently as extremely important, followed by internal appearance and shelf life at retail. The WTP results, however, shows improved shelf life at retail is the apple fruit quality trait with the highest price premium, followed by firmness and flavor. For sweet cherry, fruit size, firmness and external appearance were rated as extremely important, and shelf life at retail, sweetness, and flavor were given the highest price premium (Table 7, See Appendix). Likert scales ratings of importance and choice experiments are different tools with the common goal of eliciting respondents' preferences. The use of a scale enables respondents to express both the direction and strength of their preferences but does not force them to make tradeoffs between traits. All traits can be rated as extremely important. The discrete choice used in the choice experiments forces a trade-off between preferences and cost associated with such preferences. With the ratings results we observe the tendency of clustered ratings of importance skewed to the highest end. For example, the marginal value for the top eight traits for fresh apples ranged from 0.34 to

0.26. This might signal that when cost consideration is not associated with a choice, respondents tend to consider traits as highly important. Despite the discrepancies, both Likert scale ratings of importance and choice experiment provide useful information to breeders and the industry in general.

Conclusion

This study investigated market intermediaries' priority setting for fruit quality traits in fresh apples, peaches, strawberries, and sweet cherries. A mixed mode survey was used to elicit market intermediaries' perceptions of the importance that different fruit quality traits have for their business success. The data were analyzed using a multivariate ordered probit model.

Results from this study can provide useful information for fruit facilities' managers about the relative impact that different fruit quality characteristics can have on their business profitability. In general, market intermediaries handling product for the fresh market placed high ratings of importance on traits recognized in the U.S. grade standards as well as fruit eating quality traits. Examples of these qualities include external appearance for apples, peaches, strawberries, and sweet cherries; fruit size for sweet cherries and strawberries; fruit firmness for apples and cherries; and fruit flavor for apples, peaches, and strawberries. Characteristics such as storage life and shelf life at retail were also important, especially for intermediaries in the apple, peach, and sweet cherry markets. Firms that assigned a higher importance rating to consumer preferences when setting priorities for fruit traits assigned higher ratings of importance to the traits themselves.

Our findings support that fruit market intermediaries underscore the importance of traits in the U.S. grade standards, which are not necessarily aligned with consumer preferences. Consumers place higher importance to eating quality whereas U.S. grade standards are based mostly on appearance attributes. As for the supply chain, this study supports that preferences of fruit market intermediaries are partially consistent with those of fruit breeders, growers, and consumers. Studies like this should serve as a guide to breeding programs to ensure that their resources—including funding, time, and genetic material—are invested in fruit quality traits of importance to the whole supply chain.

In this study we elicited preferences from market intermediaries at one point in time. However, intermediaries' preferences for fruit quality traits might change over time, in consonance with changing consumers' preferences, or with specific production, marketing, or macroeconomic circumstances surrounding each marketing year. Therefore, future research should take into consideration the dynamic effects of potential factors on supply chain preferences for fruit quality traits.

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Appendix

Table 3. Average and standard deviation of market intermediaries' ratings of importance for fruit quality traits of apples, peaches, cherries, and strawberries.

	Fresh apple (N=39)	**Sweet cherry (N=33)**	**Fresh peach in California (N=28)**	**Fresh peach not in California (N=38)**	**Fresh strawberry (N=23)**
Absence of cap	--	--	--	--	3.48
	--		--	--	(1.24)
Absence of split pit	--	--	4.89	5.63	--
	--		(2.02)	(1.62)	
Aroma	4.62	--	4.57	4.66	--
	(1.16)		(1.75)	(1.30)	
Crispness	5.82	--	--	--	--
	(1.60)		--	--	
Drip loss	--	--	--	--	--
	--		--	--	
External appearance	5.95	5.71	5.11	5.62	5.39
	(1.32)	(1.64)	(2.13)	(1.64)	(2.13)
External color	5.76	--	5.04	5.59	5.43
	(1.40)		(2.24)	(1.61)	(2.04)
Firmness	5.82	5.76	4.68	5.16	5.22
	(1.59)	(1.77)	(1.89)	(1.72)	(1.93)
Flavor	5.69	5.27	5.26	5.76	5.32
	(1.36)	(1.74)	(2.40)	(1.58)	(2.36)
Internal appearance	5.89	--	--	--	--
	(1.47)		--	--	
Internal color	--	4.31	4.46	4.55	4.61
	--	(1.18)	(1.50)	(1.18)	(1.73)
Juice color	--	--	--	--	--
	--	--	--	--	--
Juiciness	5.28	--	--	--	--
	(1.39)	--	--	--	--
Nutrient	4.77	4.26	4.14	4.37	4.65
	(1.16)	(1.21)	(1.18)	(1.28)	(1.75)
Pit remove	--	--	--	--	--
	--	--	--	--	
Pit shape	--	--	--	--	--
	--	--	--	--	
Seed color	--	--	--	--	3.48
	--	--	--	--	(1.12)
Seediness	--	--	--	--	3.87
	--	--	--	--	(1.18)
Shape	5.21	4.63	4.54	4.97	4.57
	(1.24)	(1.24)	(1.53)	(1.30)	(1.53)
Shelf life at retail	5.85	5.48	5.00	5.05	5.26
	(1.51)	(1.79)	(1.91)	(1.51)	(2.07)
Size	5.66	5.91	4.82	5.70	4.87
	(1.15)	(1.77)	(2.11)	(1.70)	(1.71)

Table 3. *Continued*

	Fresh apple (N=39)	Sweet cherry (N=33)	Fresh peach in California (N=28)	Fresh peach not in California (N=38)	Fresh strawberry (N=23)
Stem attractiveness	--	5.34	--	--	--
	--	(1.52)	--	--	
Storage life	5.77	5.52	4.86	4.89	--
	(1.49)	(1.79)	(1.92)	(1.50)	
Sweetness	5.28	5.16	4.93	5.42	--
	(1.23)	(1.71)	(1.94)	(1.52)	
Tartness	4.95	4.40	4.36	4.35	--
	(1.26)	(1.10)	(1.39)	(1.36)	

Notes. Table shows the mean of the ratings of importance assigned to each fruit quality trait (1=extremely unimportant, …, 7=extremely important). Numbers in parentheses are standard deviation

Table 4. Parameter estimates and marginal effects for fresh apple market intermediaries' ratings of importance for selected fruit quality traits.

Table 4. Parameter estimates and marginal effects for fresh apple market intermediaries' ratings of importance for selected fruit quality traits.

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following importance						
		1	2	3	4	5	6	7
Intercept	2.731 (3.427)	--	--	--	--	--	--	--
External appearance	1.266*** (0.246)	-0.061	-0.063	-0.006	-0.101	-0.167	0.057	0.341
Internal appearance	1.259*** (0.248)	-0.058	-0.063	-0.006	-0.103	-0.166	0.056	0.340
Shelf life at retail	1.198*** (0.246)	-0.056	-0.060	-0.006	-0.098	-0.158	0.053	0.324
Crispness	1.184*** (0.247)	-0.055	-0.059	-0.006	-0.096	-0.156	0.053	0.320
Firmness	1.163*** (0.246)	-0.054	-0.058	-0.006	-0.095	-0.153	0.052	0.314
Storage life	1.109*** (0.245)	-0.051	-0.056	-0.006	-0.090	-0.146	0.049	0.300
External color	1.053*** (0.244)	-0.049	-0.053	-0.005	-0.086	-0.139	0.047	0.285
Flavor	0.962*** (0.242)	-0.045	-0.048	-0.005	-0.078	-0.126	0.043	0.260
Size	0.864*** (0.241)	-0.040	-0.043	-0.004	-0.070	-0.114	0.038	0.233
Juiciness	0.525** (0.238)	-0.024	-0.026	-0.003	-0.043	-0.069	0.023	0.142

Table 4. *Continued*

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following importance						
		1	2	3	4	5	6	7
Sweetness	0.505**	-0.023	-0.025	-0.003	-0.040	-0.067	0.023	0.136
	(0.237)							
Shape	0.427*	-0.020	-0.021	-0.002	-0.035	-0.056	0.019	0.115
	(0.236)							
Tartness	0.183	-0.008	-0.009	-0.001	-0.015	-0.024	0.008	0.049
	(0.235)							
Aroma	-0.138	0.006	0.007	0.001	0.011	0.018	-0.006	-0.037
	(0.234)							
Firm characteristics								
Firm's year of establishment	-0.002	--	--	--	--	--	--	--
	(0.002)							
Percentage of total sales volume handled	-0.003**	--	--	--	--	--	--	--
	(0.001)							
Percentage of apples handled by the firm	0.005**	--	--	--	--	--	--	--
	(0.002)							
Importance of consumers' preferences	0.329***	--	--	--	--	--	--	--
	(0.030)							
Firm sells to re-packer	0.172	--	--	--	--	--	--	--
	(0.139)							
Firm size	-0.003	--	--	--	--	--	--	--
	(0.073)							
Survey mode online	-0.217**	--	--	--	--	--	--	--
	(0.098)							
Log likelihood	-778.876							
Number of observations	581							

Notes. Standard errors are in parentheses. Single, double, and triple asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 level.

Table 5. Parameter estimates and marginal effects for sweet cherry market intermediaries' ratings of importance for selected fruit quality traits.

Table 5. Parameter estimates and marginal effects for sweet cherry market intermediaries' ratings of importance for selected fruit

Quality traits and firm	**Parameter**	**Marginal effects - Probability that trait would be rated the following importance**						
characteristics	**estimate**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Intercept	-1.386***	--	--	--	--	--	--	--
	(0.386)							
Size	1.683***	-0.143	-0.093	-0.037	-0.146	-0.117	0.155	0.382
	(0.277)							
Firmness	1.432***	-0.122	-0.079	-0.032	-0.124	-0.100	0.132	0.325
	(0.272)							
External appearance	1.341***	-0.114	-0.074	-0.030	-0.116	-0.094	0.123	0.304
	(0.274)							
Storage life	1.166***	-0.099	-0.064	-0.026	-0.101	-0.081	0.107	0.264
	(0.268)							
Shelf life at retail	1.133***	-0.096	-0.062	-0.025	-0.098	-0.079	0.104	0.257
	(0.267)							
Stem attractiveness	0.904***	-0.077	-0.050	-0.020	-0.078	-0.063	0.083	0.205
	(0.265)							
Flavor	0.889***	-0.076	-0.049	-0.020	-0.077	-0.062	0.082	0.202
	(0.264)							
Sweetness	0.770**	-0.066	-0.042	-0.017	-0.067	-0.054	0.071	0.175
	(0.267)							
Tartness	0.074	-0.006	-0.004	-0.002	-0.006	-0.005	0.007	0.017
	(0.262)							
Shape	0.247	-0.021	-0.014	-0.005	-0.021	-0.017	0.023	0.056
	(0.258)							

Table 5. *Continued*

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following						
		1	**2**	**3**	**4**	**5**	**6**	**7**
Internal color	0.024	-0.002	-0.001	-0.001	-0.002	-0.002	0.002	0.005
	(0.257)							
Percentage of fruit	0.0002	--	--	--	--	--	--	--
	(0.002)							
Percentage of cherries	-0.001	--	--	--	--	--	--	--
	(0.005)							
Importance of	0.316***	--	--	--	--	--	--	--
	(0.046)							
Firm sells to broker	0.397**	--	--	--	--	--	--	--
	(0.134)							
Firm size	0.255***	--	--	--	--	--	--	--
	(0.007)							
Survey mode online	-0.216							
	(0.137)							
Log likelihood	-572.492							
Number of observations	384							

Notes. Standard errors are in parentheses. Single, double, and triple asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 level.

Table 6. Parameter estimates and marginal effects for California fresh peach market intermediaries' ratings of importance for selected fruit quality traits.

Table 6. Parameter estimates and marginal effects for California fresh peach market intermediaries' ratings of importance for selected fruit quality traits.

Quality traits and firm characteristics	**Parameter estimate**	**Marginal effects - Probability that trait would be rated the following importance**						
		1	**2**	**3**	**4**	**5**	**6**	**7**
Intercept	-35.361*** (5.020)	--	--	--	--	--	--	--
Flavor	1.374*** (0.299)	-0.166	-0.060	-0.030	-0.070	-0.059	0.144	0.241
External appearance	1.098*** (0.289)	-0.133	-0.048	-0.024	-0.056	-0.047	0.115	0.193
External color	1.071*** (0.293)	-0.130	-0.047	-0.023	-0.054	-0.046	0.112	0.188
Shelf life	0.902** (0.285)	-0.109	-0.040	-0.020	-0.046	-0.039	0.095	0.158
Sweetness	0.830** (0.284)	-0.100	-0.036	-0.018	-0.042	-0.036	0.087	0.146
Absence of split pit	0.829** (0.284)	-0.100	-0.036	-0.018	-0.042	-0.036	0.087	0.145
Size	0.789** (0.285)	-0.096	-0.035	-0.017	-0.040	-0.034	0.083	0.138
Storage life	0.738** (0.283)	-0.089	-0.032	-0.016	-0.037	-0.032	0.078	0.129
Firmness	0.510* (0.284)	-0.062	-0.022	-0.011	-0.026	-0.022	0.054	0.089
Aroma	0.474* (0.279)	-0.057	-0.021	-0.010	-0.024	-0.020	0.050	0.083
Shape	0.343 (0.278)	-0.041	-0.015	-0.007	-0.017	-0.015	0.036	0.060

Table 6. *Continued*

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following importance						
		1	2	3	4	5	6	7
Internal color	0.285	-0.035	-0.013	-0.006	-0.014	-0.012	0.030	0.050
	(0.277)							
Tartness	0.242	-0.029	-0.011	-0.005	-0.012	-0.010	0.025	0.042
	(0.275)							
Firm's year of establishment	0.018***	--	--	--	--	--	--	--
	(0.003)							
Fruit handled as shipper %	0.004**	--	--	--	--	--	--	--
	(0.002)							
Peaches handled by the firm %	-0.001	--	--	--	--	--	--	--
	(0.003)							
Importance of consumers'	0.328***	--	--	--	--	--	--	--
	(0.035)							
Firm sells to re-packers	0.709***	--	--	--	--	--	--	--
	(0.255)							
Firm size	-0.473***	--	--	--	--	--	--	--
	(0.070)							
Survey mode online	0.291**							
	(0.126)							
Log likelihood	-561.120							
Number of observations	390							

Notes. Standard errors are in parentheses. Single, double, and triple asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01

Table 7. Parameter estimates and marginal effects for non-California fresh peach market intermediaries' ratings of importance for selected fruit quality traits.

Table 7. Parameter estimates and marginal effects for non-California fresh peach market intermediaries' ratings of importance for selected fruit quality traits.

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following importance						
		1	2	3	4	5	6	7
Intercept	-13.707*** (2.489)	--	--	--	--	--	--	--
Flavor	1.408*** (0.248)	-0.103	-0.049	-0.064	-0.125	-0.109	0.147	0.301
Size	1.329*** (0.249)	-0.097	-0.046	-0.060	-0.118	-0.103	0.139	0.284
External appearance	1.259*** (0.249)	-0.092	-0.043	-0.057	-0.112	-0.097	0.132	0.269
Absence of split pit	1.245*** (0.247)	-0.091	-0.043	-0.056	-0.110	-0.096	0.130	0.266
External color	1.194*** (0.247)	-0.087	-0.041	-0.054	-0.106	-0.092	0.125	0.255
Sweetness	0.999*** (0.243)	-0.073	-0.034	-0.045	-0.089	-0.077	0.104	0.214
Firmness	0.759** (0.242)	-0.055	-0.026	-0.034	-0.067	-0.059	0.079	0.163
Shelf life	0.608** (0.242)	-0.044	-0.021	-0.027	-0.054	-0.047	0.064	0.130
Shape	0.502** (0.239)	-0.037	-0.017	-0.023	-0.045	-0.039	0.052	0.107
Storage life	0.451* (0.240)	-0.033	-0.016	-0.020	-0.040	-0.035	0.047	0.097
Aroma	0.226 (0.237)	-0.016	-0.008	-0.010	-0.020	-0.017	0.024	0.048

Table 7. *Continued*

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following importance						
		1	2	3	4	5	6	7
Internal color	0.116 (0.237)	-0.008	-0.004	-0.005	-0.010	-0.009	0.012	0.025
Tartness	0.003 (0.238)	-0.0002	-0.0001	-0.0001	-0.0002	-0.0002	0.0003	0.0006
Firm's year of establishment	0.007*** (0.001)	--	--	--	--	--	--	--
Percentage of fruit handled as shipper	0.003* (0.001)	--	--	--	--	--	--	--
Percentage of peaches handled by the firm	-0.003** (0.001)	--	--	--	--	--	--	--
Importance of consumers' preferences	0.260*** (0.031)	--	--	--	--	--	--	--
Firm sells to re-packers	0.113 (0.191)	--	--	--	--	--	--	--
Firm size	0.226** (0.074)	--	--	--	--	--	--	--
Survey mode online	-0.108 (0.147)							
Log likelihood	-775.784							
Number of observations	527							

Notes. Standard errors are in parentheses. Single, double, and triple asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 level.

Table 8. Parameter estimates and marginal effects[1] for strawberry market intermediaries' ratings of importance for selected fruit quality traits.

Table 8. Parameter estimates and marginal effects[1] for strawberry market intermediaries' ratings of importance for selected fruit quality traits.

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following importance						
		1	2	3	4	5	6	7
Intercept	-15.861 (11.343)[2]							
External appearance	0.731**[3c] (0.320)	-0.065	-0.050	-0.029	-0.051	-0.014	0.065	0.145
Flavor	0.683** (0.326)	-0.061	-0.047	-0.027	-0.048	-0.013	0.061	0.136
External color	0.668** (0.318)	-0.059	-0.046	-0.027	-0.047	-0.013	0.059	0.133
Shelf life	0.516 (0.315)	-0.046	-0.036	-0.021	-0.036	-0.010	0.046	0.102
Firmness	0.512 (0.314)	-0.045	-0.035	-0.021	-0.036	-0.010	0.045	0.102
Size	0.085 (0.310)	-0.008	-0.006	-0.003	-0.006	-0.002	0.008	0.017
Internal color	-0.060 (0.306)	0.005	0.004	0.002	0.004	0.001	-0.005	-0.012
Shape	-0.110 (0.305)	0.010	0.008	0.004	0.008	0.002	-0.010	-0.022
Seediness	-0.624** (0.305)	0.055	0.043	0.025	0.044	0.012	-0.055	-0.124
Seed color	-0.889** (0.307)	0.079	0.061	0.036	0.063	0.017	-0.079	-0.177
Absence of cap	-0.893** (0.307)	0.079	0.062	0.036	0.063	0.017	-0.079	-0.177

Table 8. *Continued*

Quality traits and firm characteristics	Parameter estimate	Marginal effects - Probability that trait would be rated the following importance						
		1	2	3	4	5	6	7
Firm's year of establishment	0.008	--	--	--	--	--	--	--
	(0.006)							
Fruit handled as shipper %	0.005**	--	--	--	--	--	--	--
	(0.002)							
Fruit handled as re-packer %	0.007	--	--	--	--	--	--	--
	(0.007)							
Importance of consumers'	0.151***	--	--	--	--	--	--	--
	(0.050)							
Firm sells to re-packers	-1.400***	--	--	--	--	--	--	--
	(0.324)							
Firm size	0.372**	--	--	--	--	--	--	--
	(0.123)							
Survey mode online	0.746***							
	(0.154)							
Log likelihood	-424.934							
Number of observations	275							

Notes. Standard errors are in parentheses. Single, double, and triple asterisks (*, **, ***) denote statistical significance at the 0.10, 0.05, and 0.01 level.

Table 9. Top fruit quality traits across breeders, growers, market intermediaries and consumers

Table 9. Top fruit quality traits across breeders, growers, market intermediaries and consumers

Crop	Breeders	Growers	Market intermediaries		Consumers
	Online survey	*Audience survey*	*Mail-in and online survey*	*Mail-in survey*	*Various methodologies*
	Rating of importance + likelihood of including in program	*Ranking of importance*	*Rating of importance*	*Choice experiment*	
Fresh apple	Crispness	Flavor	External appearance	Shelf life	Crispness
	Juiciness	Crispness	Internal appearance	Firmness	Size
	Storage life	Firmness	Shelf life	Flavor	External color
	Shelf life	Shelf life	Crispness	Crispness	Texture
	Acid-sugar balance	Juiciness	Firmness	Size	Juiciness
					Sweetness
					Firmness
					Aroma
					External Appearance
					Tartness
					Flavor
Sweet cherry	Firmness	Size	Size	Shelf life	Taste
	Size	Flavor	Firmness	Sweetness	Freshness
	Res. pow. mildew	Firmness	External appearance	Flavor	Color
	Ext. harvest season	No pitting	Storage life	External color	Shape/size
	Self fertility	Res. pow. mildew	Shelf life	Size	Sweetness
					Flavor
					Firmness
					Uniformity
					Acidity
Fresh peach in California	Firmness[1]	--	Flavor	Sweetness	Freedom from defects[1]
	Fruit uniformity		External appearance	Firmness	Color
	Fruit shape		External color	External color	Maturity
	Size		Shelf life	Appearance	Size
	Prod. consistency		Absence of split pit	Size	Sweetness
					Acidity
					Astringency
Fresh peach not in California	Firmness[1]	Flavor	Flavor	Size	Freedom from defects[1]
	Fruit uniformity	Size	Size	Firmness	Color
	Fruit shape	Disease resistance	External appearance	Sweetness	Maturity
	Size	Productivity	Absence of split pit	External color	Size
	Prod. consistency	Prod. consistency	External color	External appearance	Sweetness
					Acidity
					Astringency
Fresh strawberry	Flavor	Flavor	External appearance	Flavor	Flavor
	Productivity	Firmness	Flavor	Firmness	Sweetness
	Shelf-life	Shelf-life	External color	Size	Juiciness
	Size	Open plant canopy	Shelf life	External color	Freshness
	External color	External color	Firmness	Shelf life	Taste
					Firmness
					Fruit color
					Size

[1] There was no separation from fresh peach breeding programs in California versus breeding programs not in California. Also no separation from consumers' perception of peaches fromCalifornia and not in California.

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Horizontal Arrangements and Competitiveness of Small-Scale Dairy Farmers in Paraná, Brazil

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Abstract

This study considers the effect that horizontal arrangements (HA) have on the ability of small-scale farmers' to stay competitive by analyzing whether dairy farmers in Brazil who engage in horizontal alliances are potentially more competitive.

Using a multidimensional approach and quantitative analysis, on-site surveys were conducted with 120 small-scale dairy farmers in Paraná, Brazil. The method utilized exploratory factor analysis (EFA), identifying four factors and corresponding drivers. A comparison was performed between two groups of farmers utilizing a Student's t-test. Results found significant differences between farmers engaged in horizontal arrangements from farmers who were not. We conclude that horizontal arrangements are important mechanisms for improving farmers' bargaining power, enhancing productivity and making technological advances—which may direct private and public efforts forward by encouraging more collective actions.

Keywords: agri-food chain coordination; factor analysis; potential competitiveness; collective action; agribusiness

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Introduction

In the last two decades, a remarkable reorganization is occurring within the global food chain resulting in a competitive environment that has grown more sophisticated and complex over time. This has led agribusiness enterprises to form alliances with other companies in order to access the capabilities or resources needed to compete (Van Duren and Sparling 1998).

Recent trends have reshaped Brazilian agribusiness, stimulating changes both in horizontal and vertical relationships (Wilkinson 2010). Coordinated efforts have increased and united consumer interests resulting in more productive external chains. Transformations in the Brazilian agri-food system have directed agents to make "strategic changes in the organization of the supply chain, increase coordination, reduce costs, and raise quality—which have had an important effect on the upstream segments of the chain, such as the farmers" (Farina 2003, 3).

The Brazilian dairy chain has adapted to globalization and deregulation since the 1990s (Jank, Farina and Galan 1999, Nogueira et al. 2006, Bánkuti and Bánkuti 2012). Institutional, technological advances, increased productivity and market changes have led to organizational rearrangements, including horizontal ones. In this paper, horizontal arrangements (HA) are defined as economic or social relations among actors at the same level of a supply chain, such as a group of farmers (Baum and Ingram 2002).

The dairy chain in Brazil strategically depends on strengthening farmers' associations and structural competitiveness along the chain (MAPA 2011). Spers, Wright and Amedomar (2013) found that the most desirable future for dairy chain lie in empowering family-based farms through horizontal arrangements and emphasized better industry-producer relationships, focused on quality improvements and less formalities in the dairy sector. According to Carvalho and Rios (2007), HA organization is essential to upstream and downstream bargaining power. Farina (2003) considered collective mobilization of small dairy farmers essential to reaching scale requirements in new competitive scenarios.

Studies in other countries highlight the benefits of collective action in the dairy-production sector (Ratinger and Boskova 2013, Reardon et al. 2009). Ratokoarisoa and Gulati (2006) consider how the Indian dairy sector depends on productivity and efficiency in milk production and emphasizes the benefits small farmers cooperatives have gained through improving market access. Naik and Abraham (2009) highlight the importance of technology improvements towards furthering dairy farmers' competitiveness, also highlighted by Farina (2003) in Brazil.

Farina (2003, 13) stated that "collective action through cooperatives or associations is important not only to be able to buy and sell at a better price, but is also vital to help smaller farmers adapt to new patterns – and much greater levels – of competition". Thus, collective action is as an important strategy in enabling small-scale dairy farmers to reach competitiveness.

The evaluation of competitiveness in agribusiness is not an easy task, since there is no consensus in literature on methods and indexes to be used (Van Rooyen, Esterhuizen and Stroebel 2011). Farina (1999), in a systemic approach, emphasizes the role of competitive environment, coordination and public and private policies in firms' competitiveness. Zylbersztajn and Neves

(2000) state that agribusiness competitiveness should include private strategies, collective strategies and public policies to further value creation along the chain.

Some studies use quantitative measures to assess agribusiness competitiveness, such as: price, productivity, production costs, market share and profitability (Ait El Mekki, Jaafari and Tyner 2006, Neves, Trombin, and Kalaki 2013, Carraresi and Banterle 2015). Others evaluate agribusiness competitiveness with specific tools, such as BSC (Balanced Scorecard) and SWOT analysis (Jank, Farina and Galan 1999; Coutinho et al. 2003; Bigliard and Bottani 2010).

This study examines competitiveness as a multidimensional construct, since many factors contribute to performance and results. Martin et al. (1991) examined agribusiness competitiveness, and the competitiveness drivers. In this context, we explore potential competitiveness, as formerly defined by Ferraz, Kupfer and Haguenauer (1995). Generally, studies on potential competitiveness utilize a comparative analysis to examine the different competitiveness drivers (Martin et al. 1991; Batalha and Silva 2007; Oaigen et al. 2013, Aro and Batalha 2013, Weise et al. 2013, Oliveira et al. 2014). Analyzing farmers' performance and the competitiveness drivers is an important issue, since it may lead to higher levels of competitiveness.

According to the USDA (2015), Brazil is the fifth largest milk producer in the world, with 33.4 billion liters in 2014, representing about 6% of world's production. The state of Paraná is a traditional dairy producer in Brazil, and has recently recovered its importance nationally. According to IBGE (2014), Brazilian milk production increased 24% between 2008 and 2013, while in Paraná it boosted to 54% in the same period. Moreover, the value of milk production between 2008 and 2013, in nominal terms, increased 90% in Brazil, while increasing 150% in Paraná (IBGE, 2014). Annual milk productivity in Brazil was on average 1,278 liters per cow in 2008 and 1,492 liters in 2013 (an increase of 17%); in Paraná, annual milk productivity was 2,120 liters per cow in 2008 and 2,534 liters in 2013—a 19% increase (IBGE 2014).

Cooperatives and horizontal arrangements in agribusiness are a remarkable feature of Paraná state. In Paraná, 71.7% of dairy farmers were engaged in at least one kind of HA, such as cooperatives (47% of farmers), labor union (41.2%), or farmers' associations (26.4%) (IPARDES 2008). In 2009, 13% of the dairy processors were somehow linked to farmers' associations, such as cooperatives (8.6% of processors) or rural unions (6% of them), indicating the emergence of complex arrangements in the state (IPARDES 2010).

Considering the importance of appropriate coordination and HA for agribusiness competitiveness and the relevance of Brazilian dairy chain, the aim of this paper is to analyze whether dairy farmers engaged in HA are potentially more competitive than those not engaged in HA in Paraná, Brazil. In this research, our assumption is that HA enhances dairy farmers' potential competitiveness, through better performance on competitiveness drivers. Our hypothesis is that dairy farmers engaged in HA are potentially more competitive than those not engaged in such arrangements.

Following this introduction, section two provides a literature review on agribusiness competitiveness and HA. Section three presents the methodological procedures. Section four comprises results and discussion and, finally, section five presents research conclusions and final remarks.

Agribusiness Competitiveness and Horizontal Arrangements (HA)

Due to the recent and dynamic changes occurring in agribusiness, agents have redefined individual and joint strategies towards greater coordination, which have consequently increased the need for competitiveness (Batalha and Silva 2007). Competitiveness refers to the ability of a business to remain and, if possible, expand in the market (Farina 1999, Batalha and Silva 2007).

Batalha and Souza Filho (2009) highlight the importance of potential competitiveness in the analysis of agribusiness competitiveness, formerly defined by Ferraz, Kupfer and Haguenauer (1995) as an *ex-ante* phenomenon. Potential competitiveness comprises the firm's capability to convert inputs in outputs, thus improving performance. Potential competitiveness concerns some factors driving firm's competitive position, the latter taken as revealed competitiveness (Ferraz, Kupfer and Haguenauer 1995).

Distinct studies present some driving factors, or competitiveness drivers, for potential competitiveness. In their seminal work, Martin et al. (1991), for instance, stated that a study on agribusiness competitiveness must be comparative and consider relevant aspects such as productivity, product characteristics, technology, costs and inputs, links in the chains, demand conditions, rules and standards, and industry structure, while emphasizing the interaction between these components.

Silva and Batalha (1999) proposed the evaluation of agribusiness competitiveness through competitiveness drivers, such as technology, management, market relationship, and institutional environment, indicating convergence with other studies. Many empirical studies adopted that approach in Brazil (Oaigen et al. 2013, Aro and Batalha 2013, Weise et al. 2013, Oliveira et al. 2014, among others). Batalha and Souza Filho (2009) synthesized the relation between potential and revealed competitiveness in agribusiness, considering technology, input and infrastructure, management, institutional environment, market structure and governance structure as competitiveness drivers (Figure 1).

Coordination is an important aspect for agribusiness competitiveness (Barros, Bánkuti and Martins 2012, Batalha and Souza Filho 2009, Zylbersztajn and Farina 2010). Coordination comprises horizontal, vertical or institutional arrangements between agents along the chain. For Begnis et al. (2008), business sustainability depends on the establishment of collaborative relationships. According to Pietrobelli and Rabellotti (2006), the success of low-income farmers depends, among other factors, on the efficiency of collective groups and joint actions, such as horizontal relationships.

Bijman et al. (2006) state that horizontal arrangements can improve efficiency and effectiveness of agri-food chains, especially considering low-income producers; once those arrangements promote economies of scale and scope, risk reduction, rural development, and increased bargaining power. Such arrangements are essential for national and international competitiveness of agri-food chains (Bijman et al. 2006), which converge with our assumptions.

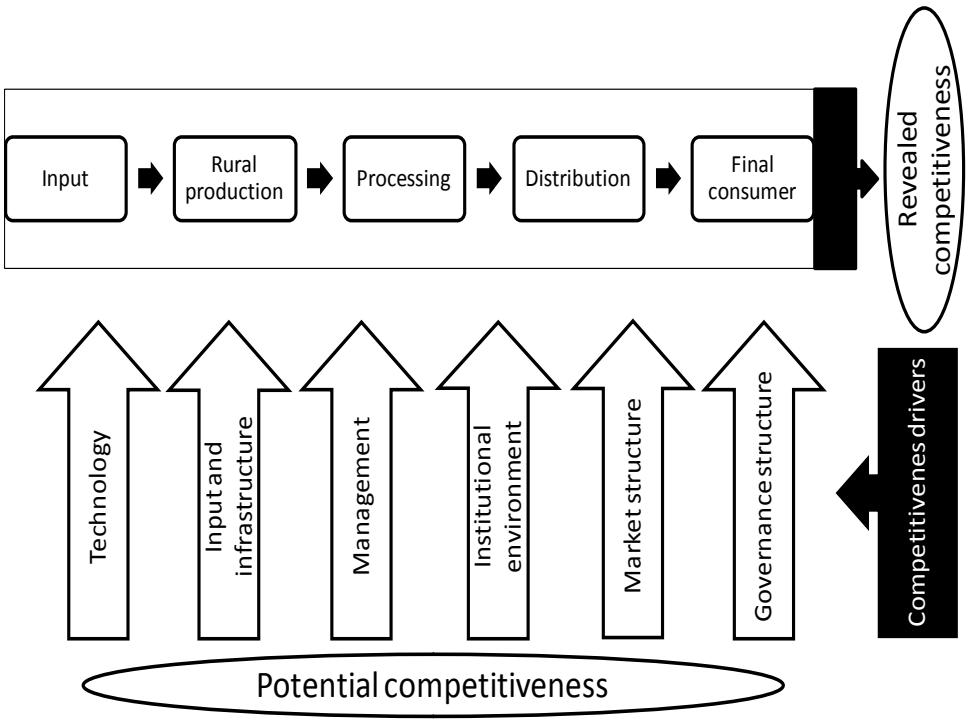

Figure 1. Potential Competitiveness and Competitiveness Drivers
Source. Adapted from Batalha and Souza Filho, 2009.

As reported by Fernandez-Stark et al. (2012), collaborative networks among low-income dairy farmers are essential to overcoming obstacles in competitive agri-food systems: they facilitate the dissemination of information about technical and productive changes, better farming practices, new materials and new production standards; those, in turn, support improvements in productivity, quality and food safety.

Horizontal arrangements are important mechanisms to access critical resources, decrease costs through economies of scale, improve network coordination, and cope with opportunism and the exercise of power in contractual relationships along the chain (Fernandez-Stark et al. 2012). Thus, HA can help farmers enhance performance in different aspects, bringing improvements in access to market, transactional conditions, technology, productivity, among others, and, consequently, to competitiveness.

Methodological Procedures

Adapting a quantitative approach, this research surveyed 120 small-scale dairy farmers using a semi-structured schedule. On-site surveys were conducted in 2013, in four regions across Paraná: Central North, Western Center, West and Southwest. Locations were selected for their regional dairy production and heterogeneity. According to information obtained from the Brazilian Census of Agriculture (2006), 7,100 rural farms were engaged in milk production in Paraná, of which 3,322 are located in the regions studied (47% of total). Combined, the four regions account for almost 50% of the family-based farms engaged in milk production in Paraná, which consists of: 736 units in Central North, 702 in the West, 679 in the Southwest and 307 in the Western Center (IBGE 2006).

In 2013, farmers in Western Center produced about 158 million liters of milk; in Central North, 212 million liters; in the West, 1.04 billion liters; and in the Southwest, 1.1 million liters. Collectively, the four regions produced about 2.5 billion liters of milk, which corresponds to 58% of the total production in Paraná. Such production generated R$ 2.2 billion in 2012 (US$ 1.23 billion) and 56% of the value of milk production in the state (IBGE 2015). Farmers' selection followed random criteria, from a previous list of dairy farmers in those regions.

Considering the adoption of potential competitiveness, multivariate techniques allowed the construction of competitiveness drivers from a set of variables. Data were treated and statistically analyzed, through the Statistical Package for Social Sciences – SPSS ®, version 18 (SPSS 2009). We performed an exploratory factor analysis (EFA). The extraction method utilized principal component analysis (PCA). We used a varimax rotation type standardization of Kaiser Meyer Olkin (KMO) and Bartlett's test of sphericity (Smith et al. 2002, Lebart 2000).

As stated by Hair et al. (2009), a factor is an underlying dimension summarizing a set of original variables, aligned with the concept of competitiveness drivers. EFA first comprised a set of 15 variables, including managerial, productive, technological, market and institutional aspects. Focusing on the segment of rural production, the competitiveness drivers shown in Figure 1 are directed at a priori selection of variables, described as:

- Technology: milking technology, cooling method;
- Input and infrastructure: number of animals, cattle genetic pattern, productivity;
- Management: sources of managerial information, access to technical assistance;
- Institutional environment: adhering to Brazilian legal requirements, participation in informal markets;
- Market structure: size of farm, milk production;
- Governance structures: ex ante conflicts, ex post conflicts, criteria for milk price definition, compliance with processor's requirements.

Variables presenting low or medium factor loadings (lower than |0.05| through Pearson method) must be removed after the prior analysis (Fávero et al. 2009), leading the final analysis to focus on the most relevant variables. To define the number of factors, we used the Kaiser criterion, which is based on the eigenvalues greater than |1.0|, as suggested by Laros (2012), Fávero et al. (2009) and Hair et al. (2009).

After generating the factors, we performed mean tests between two groups: Group 1 contained farmers engaged in HA; and Group 2 contained farmers not engaged in such arrangements. We define "participation in HA" as any form of horizontal collective group, such as affiliation with cooperatives, associations, labor unions, purchasing groups, and others. To compare groups, we performed Student's t-test, considering a significance level of 0.05.

Results and Discussion

The average area managed by120 farmers was 15.9 hectares, containing an average of 18 dairy cows. Cows were predominantly crossbred animals, representing 59.1% of the total dairy cattle. Average milk production was 236.3 liters per day, comprising 13.6 kg of milk/cow/day, on average. Regarding farmers, the average age was 46 years old, with an average of 17 years of

experience in dairy production. Additionally, 35% of the farmers had completed the equivalent of middle school, and 55% attended all or part of high school. Descriptive data, thus, indicates small-scale production was conducted by experienced, literate, and not so young farmers.

Factor analysis resulted in the exclusion of five variables, due to their low or medium factor loadings. The remaining ten variables were grouped in four factors (Table 1), all dependent on Kaiser criterion and eigenvalues greater than |1.0|. The cumulative total variance explained, using the four factors, was 72.1%, thereby satisfying the minimum criteria established for the main component analysis. The analysis resulted in KMO value of 0.718 and Bartlett's test of 0.00, indicating that the variables used are suitable for exploratory factor analysis statistics (Fávero et. al. 2009, Hair et al. 2009).

Table1. Factor Matrix

Variables	Factors			
	F1	**F2**	**F3**	**F4**
Ex-post transaction conflicts	**0.937**	-0.138	0.095	-0.037
Criteria for milk price definition	**0.947**	-0.105	0.080	-0.024
Compliance with processor's requirements	**0.929**	-0.127	-0.109	-0.035
Cattle genetic pattern	-0.200	**0.618**	0.006	0.006
Milking technology	-0.066	**0.731**	-0.114	-0.087
Productivity	-0.047	**0.742**	0.012	0.115
Cooling method	-0.011	0.345	**0.757**	0.098
Adequacy to Brazilian requirements - NI 62	-0.064	-0.246	**0.828**	-0.057
Access to technical assistance	-0.017	-0.064	0.098	**0.885**
Sources of managerial information	0.065	-0.021	0.047	**0.505**

Source. Field research, 2013.

Thus, four competitiveness drivers summarize the potential competitiveness in this research. Chart 1 presents factors, variables and their respective descriptions. Factor 1 (F1) included variables related to transactions between dairy farmers and processors, composed of the following variables: *ex-post* transaction conflicts, criteria for milk price definition and compliance with processor's requirements (Chart 1). Therefore, F1 stands for Market Relations (MR), directly related to chain coordination. F1 represents an important dimension of potential competitiveness, supported on the statements by Martin et al. (1991), Batalha and Souza Filho (2009), Zylbersztajn and Farina (2010) and Barros, Bánkuti and Martins (2012). F1 is important since the better the relationship between farmer-processor, the lower the possibility of opportunism and, consequently, the lower the risk for dairy farmers (Zylbersztajn 1995, 2009). Barriers to opportunistic behavior are an important factor to increase competitiveness (Fernandez-Stark et al. 2012, Verschoore and Balestrin 2008). In such situations, higher efficiency can lead to lower transaction costs and improve competitiveness in the chain (Fernandez-Stark et al. 2012).

Chart 1. Competitiveness drivers: factors, variables and descriptions

Factor	Variables	Description
F1 (MR)	*Ex-post* transaction conflicts	Emergence of ex-post conflicts and the need for renegotiation with processor
	Criteria for milk price definition	Transparency and farmer's participation in milk price definition
	Compliance with processor's requirements	Compliance with requirements, such as volume and quality standards.
F2 (PT)	Genetic pattern	Genetic pattern of dairy cattle (specialized or non-specialized dairy cattle breed)
	Milking technology	Use of manual or mechanical milking
	Productivity	Liters of milk per cow in milk
F3 (IA)	Cooling method	Method for cooling milk in farm
	Compliance with Brazilian requirements	Compliance with Normative Instruction 62/2011 (Ministry of Agriculture)
F4 (FM)	Access to technical assistance	Access to private or public technical assistance for dairy production
	Sources of managerial and market information	Number of sources of information about dairy market and farm management

Source. Field Research, 2013.

Factor 2 (F2) is comprised of variables related to technological production system, including: genetic pattern of cattle, milking technology and productivity. According to Martin et al. (1991), productivity is an important measurement in agribusiness competitiveness. Verschoore and Balestrin (2008) also identify productivity as an important indicator in assessing competitive gains. Barriga (1995) found technology plays an important role in increasing productivity, enabling low-income producers to compete with others. Thus, F2 comprises Productivity and Technology (PT), aligned with the findings of Batalha and Souza Filho (2009), Naik and Abraham (2009) and Farina (2003).

Two variables comprise Factor 3 (F3): cooling method and compliance with Brazilian requirements for milk production, more specifically concerning Normative Instruction 62 (NI 62) (Brasil 2011). This factor indicates institutional adequacy (IA), as variables related to the legal aspects required for milk production. Institutions and legal requirements are important components of competitiveness, as emphasized by Martin et al. (1991) and Batalha and Souza Filho (2009). Souza and Alves (2010) found that some farmers are leaving the sector because of their inability to adapt to changes in the dairy market over recent years. According to Bánkuti, Bánkuti and Souza Filho (2009), adjustments to regulation and standards are needed as it has become an important institutional barrier to dairy farmers, and the analysis is fundamental to understanding agribusiness competitiveness. According to the authors, failures on institutional adequacy may push farmers to informal market, undermining competitiveness.

Variables related to farm management form Factor 4 (F4): access to technical assistance for dairy production and sources of managerial and market information. Silva and Batalha (1999) and Oaigen et al. (2013) indicate that farm management is important to enhancing agribusiness competitiveness. In addition, education and training are important aspects for agribusiness competitiveness (Martin et al. 1991). According to Neves et al. (2002), the more farmers are involved in training courses, the higher the gains in quality, productivity, and food security.

Fernandez-Stark et al. (2012) considered how qualification and training for dairy farmers could enhance competitiveness due to (a) improvements in productivity and product quality; (b) product and process adjustments to legal and market requirements and (c) the development of entrepreneurial skills. Management training is seen as important as physical capital (Farina 2003); and also supports F4, labeled farm management (FM).

Independent variable "Participation in HA" distinguished farmers in two groups: those engaged in HA (Group 1 = 67 dairy farmers) and those not engaged in HA (Group 2 = 53 dairy farmers). Since a factor is a linear combination (linear function) of original variables (Hair et al. 2009), we cannot assume a value of reference for competitiveness from each factor. Nevertheless, factors values allow us to do a comparative analysis between groups, in relative terms.

For the factors considered, the mean values in Table 2 show the relative performances of farmers in each group. A negative value indicates a worse performance of a group compared with the other group of farmers. Results indicated Group 1 (G1) and Group 2 (G2) are different in Market Relations (MR), Productivity and Technology (PT), with farmers engaged in HA achieving higher values. Differences in MR (p-value=0.023) indicate that market conditions were better for farmers in G1. It means that farmers engaged in HA were more able to negotiate prices, deal with *ex-post* conflicts and cope with buyers' requirements, which is in accordance with statements from Carvalho and Rios (2007), Farina (2003) and Ratokoarisoa and Gulati (2006). Thus, dairy farmers engaged in HA seemed to know better how to conduct business and work with buyers. This can limit opportunistic behavior of other agents through enhanced bargaining power, supporting the findings of Bijman et al. (2006) and Fernandez-Stark et al. (2012).

Table 2. Means of factors for dairy farmers engaged in HA (G1) and not engaged in HA (G2)

HA Participation	n	Means *			
		MR	PT	IA	FM
G 1 (Yes)	67	0.1157[a]	0.2052[a]	-0.0896[a]	-0.1558[a]
G 2 (No)	53	-0.2221[b]	-0.2594[b]	0.1132[a]	0.1969[a]

Note. Means in columns followed by different letters are statistically different ($p < 0.05$), using Student's t-Test.

Regarding productivity and technology (PT), results indicate differences between groups (p-value=0.013) with farmers engaged in HA presenting higher values than farmers not engaged in HA. Thus, HA may bring technological and technical improvements, an important condition to enhancing potential competitiveness. These findings support previous statements from Naik and Abraham (2009) and Ratokoarisoa and Gulati (2006).

No statistical difference (p-value=0.268) was observed between dairy farmers in G1 and G2 for F3 (IA), which indicates that participation in HA has not influenced compliance with legal requirements or the method chosen for cooling milk. Ninety percent of interviewed farmers produced in accordance with Brazilian legal requirements, especially to NI 62 (Brasil 2011). Conditions imposed by processors may bring such results, since dairy processors in those regions have enforced farmers to follow NI 62. Thus, it seems that enforcement to legal requirements are linked to industry's action, which concurs with Farina (2003), when considering the emergence of the strictly coordinated system within the dairy sector in Brazil. In this sense, although institutional adequacy is an important competitiveness driver, it appears not to be related to HA, as it is not linked to any other aspects.

Finally, there was not a difference (p-value=0.254) between G1 and G2 in the case of F4 (FM). Horizontal arrangements have not given farmers better results in management and technical assistance. The organizational environment in Paraná has favored access to such information in recent years. Technical and productive information is widely available and easily accessible to farmers, such as that offered by the National Rural Educational Service – SENAR and Paraná Institute of Technical Assistance and Rural Extension - EMATER. The organizational environment has also given support to farmers in this research, since 65% of them received technical assistance from public organizations. In addition, the emergence of vertical coordination by processors may also have influenced results in F4. In this research, 11 % of the farmers surveyed declared that processors provide technical and/or managerial assistance and were important sources of information. Again, greater coordination by processors in the dairy chain seems to influence results in farm management.

Figure 2 illustrates the primary findings. In our analysis, four competitiveness drivers (factors) summarize potential competitiveness of small-scale dairy farmers. Results show that HA enhances productivity, technological, and market conditions for dairy farmers, although they are not related to the institutional and managerial aspects. Our findings are relevant to understanding the role of HA plays in dairy chain competitiveness, specifically concerning rural production. The emergence of HA among farmers may help improve potential competitiveness, at least in some regards, especially in those more directly linked to market performance. If farmers can reach higher productivity levels, better technical and technological conditions, improve bargaining power and mitigate processors' opportunistic behavior, they will have more opportunities to improve economic performance and be competitive. Moreover, evidence shows that HA engagement may provide farmers ways to self-invest through access to better prices, and other key resources such as cooling equipment, milking methods and specialized dairy cattle breeds.

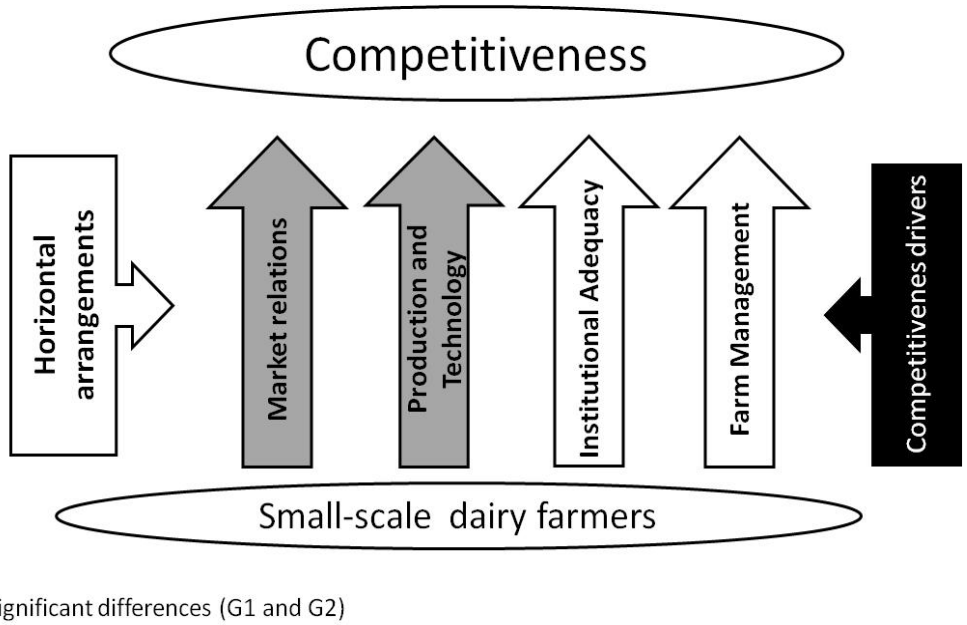

Figure 2. Potential Competitiveness and Competitive Drivers

Dairy chain restructuration, as emphasized by Farina (2003), has enabled the development of private vertical coordination in Brazil, giving processors new roles. In this sense, vertical relations prevail, and, although they can be loaded with benefits, concerns about power asymmetries emerge, as stated by Driers et al. (2009). Thus, in such complex arrangements, headed by industry, HA may be an important mechanism to balance asymmetries in the chain, favoring potential competitiveness.

Conclusions

The importance of understanding the multidimensional facets of agribusiness competitiveness motivated this research. Evidence supports our research hypothesis, showing that dairy farmers in HA are potentially more competitive than those not engaged in such arrangements, specifically within market relations (MR) and productivity and technology (PT). On the other hand, no significant differences were found among competitiveness drivers (IA and FM) related to institutional and organizational environments, which further confirm the relevance of contextualizing competitiveness using a systemic approach. The lack of significant differences for factors IA and FM may also suggest the emergence of vertical coordination by industry, indicating complex arrangements in the dairy sector. Deeper studies on competitiveness and vertical arrangements could bring relevant contributions to the analysis of agri-food systems.

This research highlights the viability of comparing potential competitiveness through factor analysis, as presented. Nevertheless, other variables could be added to future studies as suggested in agribusiness competitiveness models. Future research could apply other statistical methods to assess competitiveness, especially those resulting in absolute values of reference and more accurate measurements. This may provide a more directed analysis of competitiveness, even when the aim is not to compare groups. Additionally, future studies with farmers in HA, examining revealed-competitiveness and performance measures drivers such as profitability and return on investment, could further advance the field of agribusiness research.

Our findings reveal the complexity of analyzing competitiveness, further reinforcing its multidimensionality. The emergence of HA among farmers can help improve competitiveness for the rural segment, either by enhancing technical and productive performance, or through improving intersegment relationships and farmers' bargaining power which ultimately impacts public and private policies within the dairy sector. In this sense, farmers should be more engaged in collective actions, and the government could create public policies to stimulate the formation of HA, which could help farmers enhance their performance in the intrafirm aspects of technology and productivity; and with extrafirm concerns such as market relations and contractual imbalances.

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The Effects of Outcome Expectations on Individual's Anxiety and Continued Usage of Mobile Devices: A Post-Adoption Study

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Abstract

Mobile devices support both work-related and non-work-related activities, thus allowing adopters to communicate with co-workers and family members, access and share information on the Internet, and manage business activities. The complexity of mobile applications can impact the degree to which users like or dislike their mobile devices. This study examined how preconceptions of personal-related and business-related outcome expectations impact user anxiety and the continued usage of mobile devices. Data collected from 158 Illinois farmers who use mobile devices revealed that performance expected outcome helps reduce anxiety and both types of expected outcomes lead to continued usage. In the post-adoption era, one's ability to utilize mobile devices for personal and business related purposes will fuel continued usage of smart devices. Knowing that anxiety is detrimental to continued usage, designers of mobile applications should find ways to reduce anxiety by focusing on users' preconceptions of how the devices are to be used.

Keywords: anxiety, continued usage, information and communication technologies (ICTs), mobile device, mobile applications

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Introduction

In the recent past, there has been an explosion in the use of mobile devices and their applications by farmers in the United States. A 2011 study by *Successful Farming* magazine revealed that 94% of respondents had "a cell phone, BlackBerry, iPhone, or other device that is also a cell phone" (Walter). 70.2% of U.S. farmers used their smartphones to obtain agriculture related information and services and 60.2% had access to the Internet via their smartphones. Approximately one-third of respondents indicated that they used their smartphones to access the Internet on a daily basis. The relative newness of mobile computing in U.S agriculture was substantiated by Woodill and Udell (2012) who reported that most scholarly articles on the subject had been published in 2011 and 2012. Reasons for the rapid increase in usage of mobile devices include the introduction of tablet computers, the introduction of mobile information portals for agriculture by government agencies and private enterprise, and the introduction of applications (apps) that allow wireless monitoring and management of farms and farm workers. Woodill and Udell compiled a list of 60 apps, 33% of which were farm management apps, designed for agriculture in Canada and the U.S.

Of interest to practitioners is the continuing use of mobile device technology, or what is referred to in the literature as post-adoptive information technology (IT) usage (Ortiz de Guinea and Markus 2009), by farmers. The objective of this study was to analyze the relationships among outcome expectations, anxiety associated with the use of mobile devices, and continuing use of mobile devices by farmers in Northern Illinois.

Theoretical Foundation

Ortiz de Guinea and Markus (2009) reviewed the literature pertaining to continuing IT use, and they observed two premises. The first is that continuing IT use is a series of conscious decisions, or reasoned actions, that involve two key inputs: 1) perceptions of ease of use and usefulness, and expectations derived from experiences and beliefs, and 2) a set of emotional responses to the use of technology. The second premise is that much of the observed continuing IT use is habitual behavior.

Most agricultural land is currently owned by older producers, and according to the Farm LASTS project at the University of Vermont, 70 percent of all farmland will change hands in the next 20 years. As younger farmers become more and more involved in decision making, agribusinesses and agri-marketers will need to know how these younger decision-makers prefer to receive information. Their preferences will likely differ from previous generations (Smither and Covrig 2012). There are many studies regarding U.S. farmers' adoption of computers and the Internet, but studies of information and communication technology adoption and diffusion of that technology among U.S. farmers are scarce (Amponsah 1995; Batte, Jones, and Schnitkey 1990; Jarvis 1990).

Gloy and Akridge studied factors that influence adoption of personal computers (PC) and utilization of the Internet by a small segment of the nation's commercial farms (sales in excess of $100,000). They found a positive correlation between total farm sales and adoption of personal computers. While age and education were found to be important in explaining the probability of

PC adoption, the probability of Internet use declined with age whereas likelihood of computer adoption increased with higher levels of education (above high school). Farms with detailed management plans were much more likely to adopt the Internet; however, Internet adoption was not strongly related to profit and production per unit of input maximization goals.

Batte and Ernst (2007) investigated how willing farmers were to substitute online merchants or national farm input stores for local businesses. They concluded that farmers were willing to "purchase inputs from online or national stores outside their communities if compensated with lower prices or if the national store was able to provide other services (ready availability or delivery)" (p.92).

Mishra et al. (2009) identified factors associated with adoption of computers with Internet access among U.S. farm households using 2004 Agricultural Resource Management Survey (ARMS) data. They specifically examined the farm, operator, spouse, presence of children, regional, and household characteristics and their influence on Internet purchasing patterns including purchase of farm business inputs and household items. They found that older farmers were less likely to adopt computers with Internet access and that participation in government programs increased the probability of Internet adoption. They suggested that "farm households will consider using the Internet as a low-cost method for marketing their products to a much broader set of consumers" (p.255).

There are a few, relatively recent studies that focused on farmers and adoption of information technology in other countries (Katengeza 2011; Islam 2011; Mittal and Tripathi 2009). Katengeza assessed drivers of adoption of mobile phone technology for agricultural marketing by smallholder farmers in Malawi. Islam investigated factors that influenced adoption of mobile phone technology by farmers in Bangladesh. Mittal and Tripathi analyzed the use and impact of mobile phones and mobile-enabled services on Indian farmers' agricultural productivity. They attempted to answer the following questions:

- Are mobile phones in practice being used for agricultural purposes, and if so, how?
- Have mobile phones helped improve the agricultural productivity of farmers, and if so, how?
- Which types of agricultural information are of high value for farmers?
- What are the constraints to the potential use of mobile phones in improving agricultural productivity?

The authors reported that Indian farmers benefited from mobile phone enabled information services through improved agricultural productivity. Warren's study of British farmers found positive associations between increasing use of information communication technologies (ICTs) and 1) increasing farm size and 2) farmer education, and a negative association between increasing use of ICTs and farmer age (Warren 2004).

The 2013 USDA-NASS survey revealed that 70% percent of U.S. farms had access to a computer, 67% had Internet access and 40% were using computers for their farm business. Within the state of Illinois, 71% of farmers had access to computers, 70% had Internet access and 53% used computers for farm business. While 47% of Illinois farmers used the Internet to

conduct business on non-agricultural websites, a very small percentage of them used the Internet to conduct business with the USDA and other federal agencies (8% and 7% respectively). The primary methods of internet access were Wireless (31%) and DSL (26%), followed by Satellite (19%), Cable (17%), and Dialup (2%). The 2012 Agriculture Census revealed that older farm operators were less likely to report Internet access (55.7% of farmers 65 years and older vs. 77% of farmers less than 45 years old). Moss (2012) suggested that while a conventional audience (the older farmer) might prefer to receive information primarily in print and broadcast, a contemporary audience (the younger farmer) is very comfortable with digital media and wants to participate in a social media conversation.

Walter (2011) reported that farmers were quickly adopting smartphone technology, and he identified several work-related functions that those devices allowed farmers to complete: sending/receiving email; checking weather, news, and markets; accessing agriculture related information and services; and text messaging family and employees. Slightly more than half, 53.8 percent, of farmers' smartphones contained GPS/navigation (telematics) functions. Farmers can also use the Internet to search for input suppliers and to locate potential buyers for their products (Mishra et al. 2009). As Whitacre et. al. (2014) suggest, information technology use at the farm-level includes mapping site-specific soil properties, yield monitors, variable rate applications, automated guidance and a recent emphasis on big data. They also stated that telematics require internet access with high speed wireless broadband. Walter (2011) found that younger farmers were making greater use of smartphones. Moss and Steever (2012) reported that farmers were using mobile devices to access the Internet on a daily basis because mobile devices are seen as quick and current.

Figure 1 shows the external and internal factors impacting technology acceptance. Internal factors include demographics of the individual farmer and their farm operations, record keeping practices, and number of employees. Technology availability and quality are considered external factors. Given the internal and external factors, farmers will evaluate the usefulness and ease of use of new information and communication technology before adopting it.

While previous studies have focused on how farmers utilize the Internet, few empirical studies have investigated post-adoption of ICTs by U.S. farmers. The rampant use of smart devices and tablets can be a determining factor that helps agribusinesses (input and service providers) and agri-marketers design more effective communication programs for farmer clients who must make farm-related decisions on a daily basis. The objective of this study was to investigate how post-adoption of mobile devices shapes users' outcome expectations, anxiety and continued usage. In other words, the study examined how the *post-adoption* of mobile devices —*the stage in which mobile device usage has already brought forth user's perceived expected outcomes*— influences anxiety and continued usage once users have adopted the technology.

Expectation outcomes were separated into two categories, personal and performance, as per Compeau et al. (1999). In our context, performance outcome expectation is defined as the perceived improvements in job effectiveness and efficiency when using mobile devices. Personal outcome expectation is "related to expectations of change in image or status or to expectations of rewards" (Compeau et al. 1999, 148). Anxiety is the negative feeling that one has when using a mobile device. Therefore, the research was designed to answer the following questions:

(1) Do users' personal and performance outcome expectations affect anxiety or continued usage? And; (2) Does a users' anxiety affect continued usage?

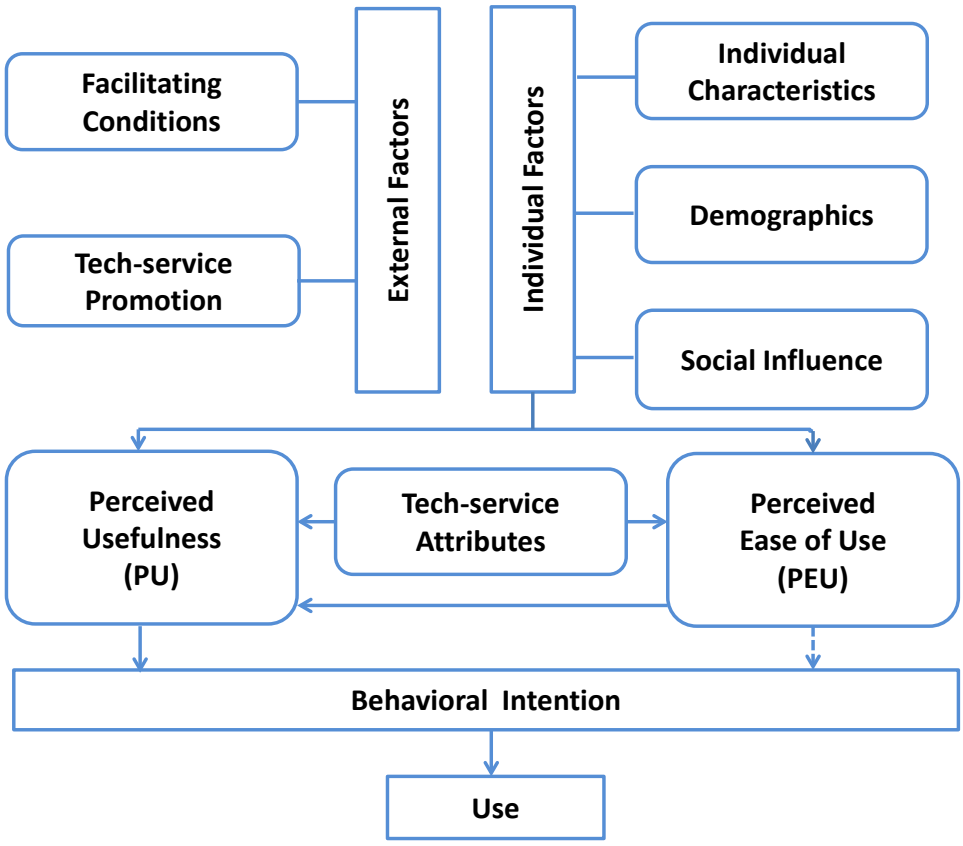

Figure 1. The Rural Technology Acceptance Model (RuTAM)
Source. Islam 2011

Research Model

Islam (2011) applied Davis' (1989) Technology Acceptance Model (TAM) in rural settings (RuTAM) in Bangladesh, and found that both external and internal factors contributed to the usage of a specific information technology. To date, a considerable number of empirical studies have attempted to extend the framework by adding relevant, exogenous constructs to the model. However, TAM does not predict the consequences after initial adoption.

The Information Systems (IS) Success Model, proposed by DeLone and McLean (l992), suggests a comprehensive view of information technology usage from initial adoption to post adoption—the stage in which the technology has been accepted by the majority. In this context, information technology use and user satisfaction are mediating factors that lead to individual impact and later organizational impact (DeLone and McLean 1992). Furthermore, our proposed research model takes on a similar theme as suggested by de Guinea and Markus (2009), revealing that post-adoption of information technology involves users' rational decision making; emotion and habitual, which is influenced by "environment cues" and "conscious intention".

A post-adoption behavior of the user of ICTs can be determined by accessibility of ICT that allows users to compare their expected outcomes to the actual outcomes (Bhattacherjee 2001). In the post-adoption scenarios, the reduced gap between prior and post outcome expectations motivates continuous usage, unless habitual usage overrides rational thinking or emotional responses (de Guinea and Markus 2009).

When individuals utilize mobile devices on a daily basis, usage activities can become a habitual routine. However, when post-adoption usage behaviors are not habit-forming, the ubiquitous nature of smart phones and devices is the interplay between rational decisions and emotional reactions. Wakefield and Whitten (2006) reported that the combined aspects of work-related and non-work-related behaviors motivate mobile usage. Bruner and Kumar (2005) found that work-related and non-work-related activities are the necessary ingredients for the adoption of consumer-based Internet handheld devices. This understanding, therefore, put our study in the context of rational decision making and emotional response of ICT usage: On one hand, U.S. farmers seek to increase their business-related activities through the use of their smart devices, while on other hand, they also utilize the devices for personal (non-work-related) activities. Both personal and business-related activities conjure up two dominant emotional responses (i.e., anxiety and continued usage) as consequences of post-adoption expectations. Figure 2 shows the proposed research model.

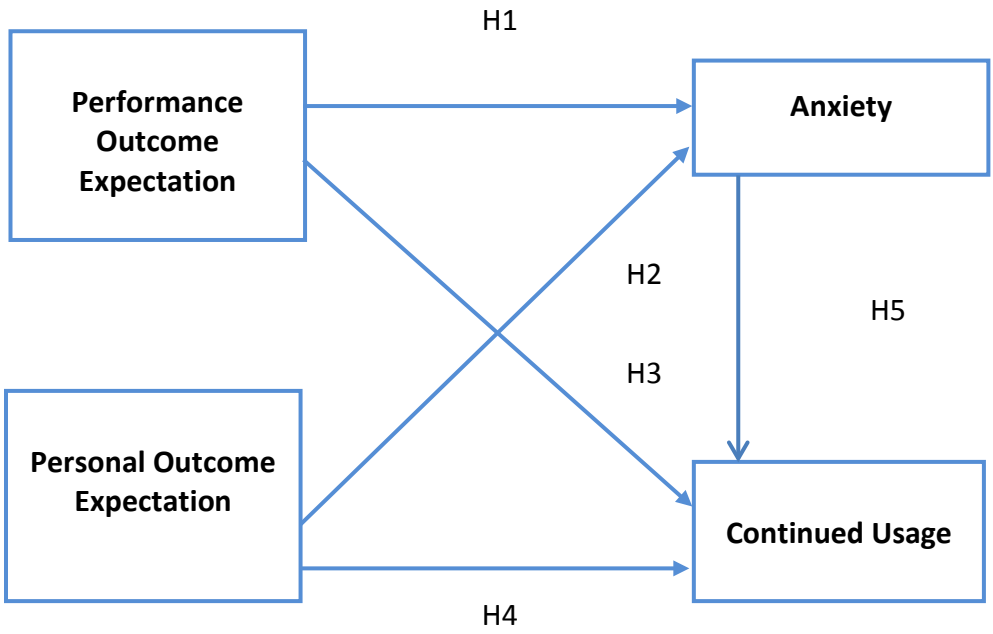

Figure 2. Proposed Research Model

Hypotheses

Researchers have found that anxiety and performance are negatively correlated. In the area of information technology education, the experience from using e-mail and the Internet has a negative relationship with anxiety (Fuller, Vician and Brown 2006). Because ICTs facilitate

written and voice communication, Vician and Davis (2003)—in their study related to computer-based learning—discovered that higher levels of computer anxiety combined with voice communication led to decreased performance. Desai (2001) generalized from existing literature that "a negative relationship exists between computer anxiety and performance" (p. 141) and questioned whether, based on the exploratory findings, the relationship between the level of computer anxiety and performance can be lessened by task familarity. In the context of post-adoption behavior, users are quite familiar with various tasks on their smart devices. It is possible, therefore, that performance and personal outcome expectations will have an effect on anxiety. Therefore, we propose the following hypotheses:

H1: Performance outcome expectation will have a negative influence on anxiety.
H2: Personal outcome expectation will have a negative influence on anxiety.

Research suggests that user's perception of technology—combined aspects of intrinsic and extrinsic motivation (i.e., enjoyment, usefulness, playfulness and ease of use)—foster continued micro-blogging activities (like Twitter) (Agrifoglio et al. 2012). A qualitative examination leads to the conclusion that external factors (i.e., technological, organizational and environmental) along with self-efficacy and expectations lead to continued technology usage (Hossain and Quaddus 2011). Hsu et al. (2004) validated that user's "prior perceived confirmation," prior satisfaction, and self-efficacy lead to continued usage of the Internet. Specifically, their results indicated that outcome expectation provides the strongest support for continued usage (Hsu et al. 2004). Performance expectancy, social influence (personal expectancy) and user satisfaction enhance the utilization of information technology (Kim et al. 2007). Generally, users anticipate positive consequences as a result of technological usage. Any positive consequences will reinforce continued usage; negative or unanticipated consequences will lead to anxiety and discontinued usage. Compeau et al. (1999) revealed that anxiety reduces information technology usage. Based on these empirical findings, we propose three additional hypotheses:

H3: Performance outcome expectation will have a positive influence on continued usage.
H4: Personal outcome expectation will have a positive influence on continued usage.
H5: Anxiety will have a negative influence on continued usage.

Data Collection

A questionnaire was mailed to 1,000 farmers who were randomly selected from a list maintained by 1st Farm Credit Services of Illinois. The main decision maker was asked to complete the questionnaire, which included questions about farm and farmer demographics (age, education, gross farm income, number of employees, and acres farmed); current ICT use (type of cellular phone, computer, tablet); preferred sources of information for farm related decisions (in print vs. electronically/digital, social media use, text messages, farm related websites, etc.); types of work-related activities farmers do or would like to accomplish via ICTs; and challenges faced when adopting ICTs. A $1,000 donation to St. Jude Children's Research Hospital on behalf of the respondents was offered as an incentive to participate. Respondents were also offered a copy of the study results. The original mailing occurred in mid-April 2012, and a second mailing occurred in June 2012.

Of 360 respondents, the study used information provided by 158 individuals who had at least one mobile device (i.e., smart phone or tablet) in their possession, and who responded to all questions related to continued usage, anxiety, and outcomes expectations. We analyzed non-response bias by comparing the average age, average acres farmed, and four other research variables by those who returned the first mailing of the questionnaire to those who returned the second mailing. Such a comparison has been proposed by Lindner, Murphy, and Briers (2001), who cited extrapolation methods based upon the notion that late respondents are similar to non-respondents. Lindner, Murphy and Briers suggested that the group of late respondents contain a minimum of 30 individuals. There was two years of age and 28 acres difference between the first and second mailing respondents, which were statistically insignificant. There were no statistically significant differences in performance outcome expectation, personal outcome expectation, anxiety, and continued usage scores either. Based on Table 1, we concluded that there was no non-response bias which means that non responses did not impair the representativeness of the current sample.

Table 1. Test for Non-response Bias

	1st Mailing (n=112)		2nd Mailing (n=46)		
Variables	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**	**t-test**
Age	48.4	13.3	46.3	14.2	.867, p=.387
Size of farm	1,539.0	1,680.3	1,511.0	1,846.3	.088, p=.088
Performance Outcome Expectation	3.51	.87	3.48	.90	.249, p=.804
Personal Outcome Expectation	2.91	.78	2.75	.76	1.178, p=.242
Anxiety	2.32	.89	2.25	.93	.463, p=.644
Continued Usage	3.21	.85	3.24	.94	-.181, p=.857

The average age of the respondents was 48 years, who have been farming for almost 24 years (Table 2). On average, they farmed 1,512 acres of which 964 acres were corn, 413 acres were soybeans, 15 acres were wheat, and 119 acres were marked for other. The majorityof the respondents consisted of males (93%). Almost 47% of the respondents obtained a baccalaureate or higher degree (46.8%), while 36.1% had some college or had completed a 2-year degree; 15.2% had completed high school, and a small number had not finished high school (1.3%). Half of the respondents considered themselves as first or one of the first to adopt a new technology (50.7%) while 3.8% said they are the last person to adopt a new technology. When asked to assess their general attitudes toward risk, which was undefined in the questionnaire, 9.5% of respondents identified themselves as risk averse. Alternatively, risk neutral was selected by 53.2% of respondents, and 35.4% of respondents identified themselves as risk takers. Almost 80% of the respondents use desktop computer to access internet, while 74.8% use laptop computer, 74% use a cell phone, and 56% use a tablet for internet access. Wireless and DSL were the top two connection options used to access internet, however, information on the speed of connection was not asked. Respondents used internet to check markets (97%) and weather (97%), lookup balances (88%), use marketing advisory services (73%), transfer money (67%), purchase inputs (51%) and manage on-farm systems such as GPS (39%). It is important to note that while 64% of the respondents had no livestock, 23% raised livestock, 5% raised hogs, and 4% raised dairy cattle.

Table 2. Demographics

Average age	48 years	Gender	93% Male 7% Female
Number of years farming	24 years	New Technology adoption	7% First person to adopt 43.7% One of the first people to adopt 44.3% One of the majority to adopt 3.8% Last person to adopt
Acres farmed Corn Soybean Wheat Other	1,512 acres 964 acres 413 acres 15 acres 119 acres	Attitude towards risk	9.5% Risk averse 53.2% Risk neutral 35.4% Risk taker
Livestock	64% None 5% Hogs 4% Dairy cattle	Devices used to access Internet	80% Desktop computer 74.8% Laptop 74% Cell phone 56% Tablet
Activities using Internet	97% Check markets 97% Check weather 88% Lookup balances	73% Use marketing advisory services 67% Transfer money	51% Purchase inputs 39% Manage on-farm systems

Measures

The study adopted methods used by Compeau and Higgins (1995), who derived their items from various psychological measures using a five-point scale (Table 3). To capture *continued usage*, the study applied the measurement of affect—"likability" (Compeau and Higgins, 1995). The respondents were asked the extent to which they agreed or disagreed with "I like working with mobile devices," "Once I start working on the mobile device, I find it hard to stop," and "I look forward to those aspects of my job that require me to use a mobile device." *Anxiety* was captured with items such as "Using a mobile device is frustrating to me," "I hesitate to use a mobile device for fear of making mistakes I cannot correct." *Personal outcome expectations* captured intrinsic motivational outcomes, as reflected by competence, status, and accomplishment. Respondents were asked "My coworkers will perceive me as competent if I use a mobile device," "I will be seen as higher in status by my peers if I use a mobile device," "I can increase my sense of accomplishment by using a mobile device." *Performance outcome expectations* were derived from job-related dimensions such as "Mobile device can make me better organized," "Mobile device can increase my effectiveness on the job."

Table 3. List of Measurement Items Used in the Study

Performance Outcome Expectations	**Anxiety**
Mobile device can make me better organized [PERFE1]	Using a mobile device is frustrating to me [ANX1]
Mobile device can increase my effectiveness on the job [PERFE2]	I feel apprehensive about using mobile devices [ANX2]
I could spend less time on routine job tasks by using mobile devices [PERFE3]	It scares me to think that I could cause the mobile device to destroy a large amount of information by hitting the wrong key [ANX3]
Quality of output of my job can increase with mobile devices [PERFE4]	I hesitate to use a mobile device for fear of making mistakes I cannot correct [ANX4]
I can increase the quality of output for the same amount of effort with mobile devices [PERFE5]	Mobile devices are somewhat intimidating to me [ANX5]
Personal Outcome Expectations	**Continued Usage**
My coworkers will perceive me as competent if I use a mobile device [PERSE1]	I like working with mobile devices [CUSE1]
I can increase my sense of accomplishment by using a mobile device [PERSE2]	I look forward to those aspects of my job that requires me to use a mobile device [CUSE2]
I will be seen as higher in status by my peers if I use a mobile device [PERSE3]	Once I start working on the mobile device, I find it hard to stop [CUSE3]

Data Analysis

Linear regression analyses were conducted following guidelines recommended by Gefen et al. (2000); therefore data analyses involved two steps. First, each research variable was tested to ensure construct validity and reliability using principle components analysis (PCA) (Smith, 2002) and Cronbach's alpha, respectively. PCA helped assure that each variable was distinct, thus reducing the possibility of multicollinearity; while Cronbach's alpha established the reliability of our research constructs. Second, two regression analyses were performed wherein anxiety and continued usage were regressed on performance expectations and personal outcome expectations. Items with the highest loading were used to represent the variables in the regression analyses. Hypotheses were tested at a 0.05 significance level using F- and t- tests.

Results

Table 4 shows the construct validity based on PCA and composite reliability values for each variable. Construct validity is realized after each item is significantly 'loaded' onto its designated variable. Composite reliability values were higher than 0.7, supporting the internal consistency among measurement items within each construct.

Our first regression—where anxiety was regressed on performance and personal outcome expectations—revealed a significant F-statistic of 11.58 ($p<.001$) with a coefficient of determination of .13. Our results showed that performance outcome expectation negatively influenced users' anxiety while personal outcome expectation had a non-significant impact on users' anxiety. In addition, by regressing continued usage onto anxiety, performance outcome

and personal outcome expectations, the result of our second regression showed a significant F-statistic of 48.63 ($p<.001$) with a coefficient of determination of 0.486, supporting Hypotheses 3 through 5. With the exception of Hypothesis 2, each regression path also had significant t-values, which supported our proposed hypotheses, revealing that both performance and personal outcome expectations fueled continued mobile device activities.

Table 4. Construct Validity and Composite Reliability

		Latent Construct Loading				
Research Variable	**Surveyed Items**	**Performance Outcome**	**Personal Outcome**	**Anxiety**	**Continued Usage**	**Reliability Coefficient**
Performance Outcome Expectations	PERFE1	.705	-.028	-.204	.307	.904
	PERFE 2	.796	.112	-.245	.258	
	PERFE 3	.832	.232	-.093	.063	
	PERFE 4	.823	.284	-.098	.179	
	PERFE 5	.796	.216	-.156	.152	
Personal Outcome Expectations	PERSE1	.090	.656	-.124	.307	.718
	PERSE2	.384	.711	-.002	.208	
	PERSE3	.169	.857	.115	-.043	
Anxiety	ANX1	-.097	.010	.655	-.365	.880
	ANX2	-.057	.059	.806	-.313	
	ANX3	-.162	-.128	.860	.235	
	ANX4	-.237	-.102	.865	.110	
	ANX5	-.155	.138	.818	-.219	
Continued Usage	CUSE1	.478	.085	-.323	.617	.764
	CUSE2	.341	.291	-.210	.765	
	CUSE3	.373	.272	.090	.550	

Note. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Our results were based on the hypothesized research model, focusing on empirical evidence among the four research variables, i.e., personal outcome, performance outcome, anxiety and continued usage. Age, size of farm, and education were not a part of the hypothesized research model. However, to rule out of the effects of these demographic characteristics, each of the four research variable were regressed onto age, size of farm, and education. These additional regression analyses revealed that only age had a significant effect on continued usage (F-statistic = 3.07, p =.03) with unstandardized coefficients of -.013 (t=-2.581, p = 0.11), and it accounted for six percent of the variance explained in continued usage when only demographic characteristics were used as the predictors to continued usage. Age accounted for only 1.6 percent of the variance explained in continued usage when added to the research model. None of the other research variables, however, were influenced by demographics.

In sum, multiple linear regression analyses were conducted to evaluate the prediction of anxiety and continued usage from the performance and personal outcome expectations. As hypothesized, users' anxiety is negatively influenced only by performance outcome expectations (β=-.41, t = -4.78, $p < .001$); supporting Hypothesis 1 (Table 5). However, Hypothesis 2 was rejected due to an insignificant result (β=.15, t=1.76, p=.081), suggesting that personal outcome expectation did not create users' anxiety. Both the performance outcome expectation (β=.49, t=6.95, $p < .001$)

and personal outcome expectation (β=.24, t=3.55, p = .001) influence also continued usage. Anxiety had an inverse relationship with continued usage (β=-.16, t=-2.61, p = .01), demonstrating that performance outcome expectation can indirectly hinder the continued usage of mobile devices. The overall fit of the regressions, determined by R2, showed that our proposed model accounted for 13 percent of the variance explained in anxiety and 49 percent of the variance explained in continued usage.

Table 5. Hypothesis Testing through Multiple Regression

Hypothesis	Beta	t-value	Sig.	Result
H1: Performance Outcome Expectations → Anxiety	-.407	-4.776	.000	Supported
H2: Personal Outcome Expectations → Anxiety	.150	1.756	.081	Not Supported
H3: Performance Outcome Expectations → Continued Usage	.489	6.951	.000	Supported
H4: Personal Outcome Expectations → Continued Usage	.236	3.552	.001	Supported
H5: Anxiety → Continued Usage	-.161	-2.607	.010	Supported

Discussion and Conclusions

Results showed that performance outcome expectations of users negatively influence the anxiety, which negatively influences continued usage of information communication technology by the farmers. In other words, if the farmer believes a mobile device can increase his/her effectiveness on the job, he/she would feel less anxious about the device and therefore more likely to continue to use the mobile device. Personal outcome expectation has a direct influence on continued usage. The farmer is more likely to have a continuous usage of a mobile device if the farmer believes that using mobile device makes him/her seen as competent by his/her coworkers/peers. However, the motivation for Illinois farmers to continuously utilize mobile devices and ICTs in their agribusinesses may involve other factors beyond the scope of this current study, given that our research model captures only about half of the variance explained in continued usage.

For instance, ICTs allow farmers find answers for many questions on subjects like farming practices, input and commodity prices, weather conditions, or industry trends faster and instantaneously with greater ease and increased accuracy. Knowing what channels of information and knowledge for products and services customers value and use the most would be beneficial to any business. According to Ernst and Young Report (2009), this type of information would enable businesses to administer cost saving initiatives without adversely impacting the channels or elements of the products and services that core customers value. ICTs have the potential to build higher levels of customer engagement and loyalty, if the agribusinesses successfully communicate the benefits of ICT adoption to the customers in the form of increased productivity and agricultural output.

The results could be useful for agribusinesses and agri-marketers who are interested in knowing more about their changing customer base as younger generation of farmers are taking over more responsibilities at the farm and are getting involved in the business decision making process. Knowing the farmers' preferences towards in print vs. electronic/digital delivery could help companies customize their information delivery method based on their customers' demographics. This type of customization could allow firms to "go green" without aggravating some of their customers.

While agribusinesses need to maintain a balanced media plan by incorporating smartphone marketing techniques into their media plan, they could also plan, design, and improve their correspondence with customers, especially with those who have challenges with connecting to the Internet via computers and cell phones (high speed broadband connection, cell phone service availability, etc.) (Moss and Steever 2012).

Moreover, very high level of technical competence is a sought after characteristic the farmers look for in a salesperson. Farmers also want their salesperson to provide them relevant and timely information (Downey, 2013). It could be the salesperson's role to introduce ICT offerings to the farmers which could help them provide the information and knowledge the farmer needs and is looking for in a timely manner. Farmers place high importance to field days and dealer/retailer meetings as sources of information (Akridge, 2013). Agribusinesses could take advantage of these points of contact with the farmers and show farmer customers how they can use the ICTs such as apps, social media website, and text alerts while reducing anxiety of use and highlighting the potential positive performance and personal outcomes which would then lead to continued usage of ICTs offered by the agribusinesses. Future research can investigate these potential factors to motivate continuous ICT usages among farming communities, while addressing impact of high speed wireless broadband on adoption of ICTs including telematics.

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Firm Size, Contractual Problems and Organizational Decision-Making: Logistics for Perishable Goods

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Abstract

This paper examines formalized contracts between outsourcing logistics providers and companies in the perishable food industry by evaluating relationships with specificity and uncertainty. A sample of 55 outsourcing agreements were analyzed and found that exchanges are characterized by positive transaction costs arising from contractual problems such as investments in specific assets and information asymmetries. There are several types of specificity and the impact varies depending upon the company. Contractual agreements which are designed to address each type of specificity can provide firms a safeguard mechanism.

Keywords: outsourcing, transaction costs, specific assets, information asymmetry, contracts

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Introduction

Logistics coordination is a key factor of success in the perishable food industry. An efficient supply chain brings added value to final products, as it addresses the time and temp sensitive characteristics of food safety. It therefore can potentially provide a competitive edge in the sector. Logistical services are increasingly outsourced to specialists, temperature-controlled logistics operators (TCLO). Outsourcing haulage and storage (basic logistical services) should ensure that products are handled appropriately and delivered on time. However, outsourcing services involves a number of issues, including the perishable nature of the product, investments in specialized equipment and ensuring quality standards from supermarkets are met. Consequently, this arrangement is characterized by positive transaction costs derived from contractual problems such as the investment in specific assets and uncertainty.

New institutional economics—especially the theories of transaction costs and agency provide a solid theoretical basis to explain organizational decision-making and the contractual challenges companies face. First, the provision allowing for in-house logistical services is discouraged by the legal framework that governs in Spain. Second, in order for logistical outsourcing to be successful (from an institutionalist perspective), it's important that contracts between the food companies and TCLOs are structured to reduce the impact of the above-mentioned contractual problems. These asymmetrical relationships between companies are significant with perishable goods, although the specifics and impact can vary from one company to another. This goes some way towards explaining the existence of different transaction governance structures. Contractual diversity infers that as transactions become more integrated or streamlined within a company, the contractual problems are likely addressed. This requires that contractual problems be ranked in terms of their importance to the parties.

The aim of this article is to explain why there are differences in the asymmetrical relationships among different sectors of companies in the food industry and to determine how these problems contribute to existing practices of various outsourcing agreements. This study examines the factors determining how outsourcing agreements are formalized by empirically comparing a sample of 55 outsourcing agreements in force during 2011.

This paper adds value to the empirical testing of the contractualist model. It concerns an original and recent study of a particularly complex business situation, examining the role of contracts between perishable food manufacturing companies and logistical service providers. It makes a contribution to an area which has received little academic attention: contractual relationships in the food industry, specifically in the haulage sector and temperature-controlled logistics. The main contributions of the paper are as follows:

- There are several types of specificity. Specificity is not the same for every firm nor does it affect them in the same way. Consequently, each type of specificity induces a unique response from companies in their choice of contractual forms and transaction governance. This novel application of the transaction cost theory and agency theory may be of interest to managers and other stakeholders of fresh products, value chains, and institutional economics researchers, worldwide.

- Given the difficulties in obtaining reliable, empirical data through surveys for agribusiness study, the data collected from this research potentially contributes to the existing literature. Spain has only recently developed a demand for services with high added-value, which explains why it has received so little academic attention. The Spanish food industry provides a rich backdrop of relatively unexplored territory. As food companies increasingly turn to outsourcing logistics services to get their products delivered to customers, a unique situation is occurring within the food industry and its suppliers. It requires an investment in specific assets which are diverse in nature, yet essential in the case of perishable products.

Theoretical Background

Companies must invest in assets in order to operate in the market. Assets may be highly versatile or restricted when designed for specific purposes. The level of specificity is the degree to which an asset loses some of its value when used for another activity or buyer (Alchian and Demsetz 1972). According to Williamson (1996) investments in specificity, take many forms including: (1) *site specific* (2) *human* (3) *physical*—for a particular product or customer; (4) *dedicated*—which can become specific when developed for a particular customer; and, Masten (1991, 1996) added (5) *temporal* specificity to this list, making time an important, limiting factor in transaction governance.

A crucial problem with specificity investments is that buyers and sellers will ultimately form *ex-post* bilateral monopolies when incentivized to trade only between themselves rather than involving third parties. This occurs when either the seller cannot find alternative buyers for the asset or when the buyer does not have time to find a new seller. In a bilateral monopoly[1], each party wants, *ex-post*, to benefit from the "quasi-rent"[2] generated by the investment. That can endanger the efficiency of the exchanges and the efficient quantity of specific investments *ex-ante*. If the investing company is not providing *ex-ante* guarantees on the distribution of *ex-post* benefits, no investment will be made. If this occurs, a hold-up, or market breakdown, occurs. As Williamson (1975, 1989) argued, exchanges which are subject to the influence of opportunism will only be efficient if, *ex-ante*, safeguard mechanisms are put in place to reduce the risk of *ex-post* opportunism. The design of these contractual mechanisms is thus an essential task for the participants in an exchange (Klein 1992).

[1] Coase was the first to put forward the idea that there are *costs for using the market*, which he called the "costs of market transactions" in his article "The Problem of Social Cost" (Coase 1988). In this article, Coase argues that, in order to undertake a market transaction, it is necessary to "discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed and so on" (Coase 1988, 114).

[2] Arruñada (1998) insists on the advisability of clarifying the difference between the economic concepts of "rent" and "quasi-rent". "Rent" can be defined as the excess of price above that would need to *attract* a resource for a particular purpose; whereas the term "quasi-rent" is used to refer to the excess amount it would be necessary to pay to *retain* it.

The Principal, the Agent and Information Asymmetries

An agency relationship exists whenever there is a contract with one or more persons, known as the principal(s), who hires another person—the agent, to carry out an activity or make decisions on their behalf in exchange for payment (Ross, 1973; Salas, 1996) The problem for the principal resides in the fact that the agent possesses greater specific knowledge on the task to be performed, leading to an asymmetrical situation between the two contracting parties. The agent has a certain amount of room to maneuver, and their actions are difficult to monitor, as the activities cannot be observed closely. Even if they could, the costs of collating this information would be too high. The central dilemma for this scenario, known as the *agency theory* is how the principal can motivate the agent to defend the principal's best interests and not their own personal gains. Thus, the theory predicts that it is necessary to design a contract that provides incentives that will induce the agent to choose the best possible actions and decisions from the principal's point of view. Information asymmetries are a consequence of the fact that every participant usually has more information about one or other of the relevant variables. This situation can occur both before or after hiring takes place, giving rise to two different types of problems: if the asymmetry exists before hiring, negotiation problems and adverse selection transpire (Akerlof 1970)[3]; if the asymmetry only appears after hiring, then a moral hazard arises (Fama 1980) [4].

Therefore, in the case of the outsourcing perishable food logistics, one would expect the following propositions:

a) Investment decisions in specific assets will be protected by contractual safeguard mechanisms that reduce the risk of ex-post opportunism.
b) There are different types of assets and their impact varies from one company to another.
c) Each type of specificity requires a different type of contractual response.
d) As the contractual safeguard used becomes more integrated into the company, investment specificity is most relevant to the company.

Empirical Applications in the Food Industry

Food industry research provides some interesting recent studies on primary production worth highlighting. Focusing on avocado production, Arana et al. (2013), show how decisions made by producers adopting private quality certifications directly correlate to higher levels of asset specificity and prices received for products. Studies regarding milk production from Bakucs et al. (2013) and Abdulai and Birachi (2009) found that specific investments and firm size are the

[3] Research undertaken in the industry has demonstrated that the TCLOs are interested in maintaining a good reputation. This is achieved by fulfilling promises made and by providing customers with quality service that exceeds agreements, etc. This "good image" possessed by the operator provides an implicit guarantee of the trustworthiness of the service they provide. In turn, this means that the company is able to transmit, by means of the name or brand which differentiates the company from its competitors, a clear signal of its reputation or "good name" to potential customers. In practice, this resolves the problem of *ex-ante* information asymmetry. Frequency transaction acts in the same direction.

[4] Trust consists of a reduced suspicion that the other party involved in the transaction will behave opportunistically, or an expectation that they will not. Thus, if trust exists, the contracting parties will be convinced that they will not fall victim to behaviours such as moral hazard or other types of contractual vulnerabilities.

main predictive factors for the choice and design in contracts between primary producers and the processing industry. Further important empirical research concerns the exploration of contractual relationships between farmers and agro-industrial companies working on a contract farming basis with professional farmer co-operatives and the adjoining link in the commercialization chain; and between farmers and supermarkets. In these cases formal contracts are positively correlated with the scale of production, while public certification of quality and safety attributes are contract substitutes in the regions where certification is effective (Jia and Huang 2011; Guo and Jolly 2008; Ruben et al. 2007).

Material and Methods

Data Generation

The focus of this study concerns the contracts governing outsourcing services for the provision of perishable food logistics. The propositions were tested on a representative sample of 61 companies[5], 55 of which belonged to the food industry, with six being TCLOs. The methodology employed for the collation of corresponding information from each company consisted of detailed interviews[6], using open-ended questions to enable the company to reveal its experience more authentically. In every case, the interviewees were executives with direct responsibility for managing outsourcing agreements. Information on the following issues was collected:

Table 1. Type of Data Collected from Food Firms and TCLOs

TCLOs	Food Companies
Company overview	Company overview
Relationship development with clients	TCLOs capacity to meet company needs
Contracts and contractual problems	Mechanisms used for monitoring and controlling goods
Mechanisms used for monitoring and controlling goods	Development of relationships with TCLOs, contracts and contractual problems
TCLO capacity and cost structure	Cost of outsourced logistic
Improving the quality of service	Improving the quality of service received

To design the study sample, companies continued a process which consisted of several stages: 1) gathering information on existing firms, 2) debugging information; and 3) selecting companies to be interviewed (Hernández et al. 2003). The information was prioritized to contain every possible case of contractual problems and outsourcing agreements existing within the transaction, including companies with the following:

- Different sizes, depending on criteria used by the European Commission.
- Different subsectors: frozen fish, meat products and frozen precooked, frozen pastries, frozen vegetables, ice cream, fresh meat products, fruits and vegetables, sausages and hams, fresh fish, juices, dairy products, eggs, "horchata", candy.

[5] According to the National Institute of Statistics, the turnover of the companies in the sample represents 27 percent of the regional food industry. The sample of 61 companies gives a sampling error of 9.5% and a confidence level of 95.5%.
[6] The interviews were conducted between January and July 2011.

- Products with different characteristics: chilled, frozen, frequent replacement.
- Different destinations: wholesalers, supermarkets and hypermarkets, groceries, bakeries, restaurants, hotels.

A single procedure was followed to collect information. Company managers were contacted by telephone explaining the purpose of the investigation, a supplication for cooperation and a request for a meeting. Of the 72 firms contacted, 61 responded positively— a success rate of 85 percent.

A wide range of information was collated from the interviews questions which were compiled into different formats and grouped into the following categories:

a) dichotomous questions: the interviewee chose between two options, then was able to freely express their reasons for doing so;
b) questions containing a wide range of possible answers offered in order to determine all that were important to the interviewee and why. Applicants could also add to the list of options presented to them;
c) questions for which the interviewee was given complete freedom in their answers, regardless of the qualitative or quantitative nature

Many of the quantitative questions were measured using established numerical indicators. However, if the variables included a subjective component—such as asset specificity (typical of new institutional research), difficulties were encountered when assigning numerical values. Therefore, these were measured using qualitative indicators (high, medium and low). Over the course of the interviews, each company was requested to provide information on the number of different types of contracts used. It was then determined that it was not possible to record this information, since companies were unable to accurately determine how many transactions were carried out in the spot market and how many by means of a signed contract, or even the volume of merchandise concerned in each case[7]. Consequently, the unit of analysis in this study is not the transaction, but the company, and so only the main contractual formula used in transactions occurring in 2011 for each manufacturing company was recorded.

Results and Discussion

Characterization of the Contractual Problems

Specific Assets and Consequences

An analysis of specificities reveals various types of specific assets. At the TCLO, the human management and food handling team must have sufficient experience, led by trained staff and

[7] The numbers involved varied according to the time of year (food distribution is subject to significant seasonality) and even according to the recipient of the goods. It is also worth noting that, due to the high number of verbal agreements in place in the sector, there was generally no paper or electronic record of the information we were looking for.

adhere to the customer service philosophy defined by the TCLO[8]. Despite these requirements, TCLOs investments in human assets were rated low by the companies in the sample. Although all staff, including drivers, can function in different capacities as necessary, to assist customers without any notable reduction in service, an element of specificity beyond the scope of primary service is the training is required to handle perishable food appropriately, i.e. the skills necessary to ensure temperatures are strictly controlled.

Vehicles and facilities handling the storage of goods must at all times meet customer specifications[9]. Under the category of physical assets, companies interviewed rated heavy goods vehicles and cold storage facilities at medium-low specificity. It is the refrigerating capacity of such equipment that gives them their specificity, although they could be used for other transactions with different customers without suffering value reduction. However, the number of different products such equipment can be used to transport and store is limited. Another essential physical asset is an IT system capable of *real time* management of information generated from start-to-finish processes, including: receipts, storage, order preparation, delivery and incident reporting. Integrated systems interfacing with customers' IT systems ensure inventory integrity[10]. Although IT systems of this type are specifically designed for a particular logistical activity, they can be installed on any platform across various industries (food, drinks, detergents, domestic electronic appliances, toys, pharmaceuticals, cosmetics, etc.) and be used with any customer. Therefore, its level of specificity is considered medium-low intensity.

Dedicated assets, including those designed exclusively for a particular customer, play major roles. TCLOs may dedicate a substantial portion of human or physical assets to a particular customer. The investment risks are high should the relationship collapse, leaving TCLOs to process excess capacity, including additional staff, equipment and fleet expansion investments—creating unforeseeable and problematic concerns.

Such assets in this case are considered to have a medium-low level of specificity. However, the situation is drastically different when TCLOs invest in creating logistical platforms which only serving a single (and normally large) customer. If the customer goes elsewhere, the platform no longer has a clear use making it difficult to find other customers with similar needs and remain profitable. These are therefore high-intensity dedicated assets. A similar case involves the location of a TCLOs logistics hub near the customer's or the consignees' facilities. If the

[8] The staff must also possess the right skills for the appropriate use of the equipment used in warehouses for the movement, handling, safety, and monitoring of goods and the fleet of vehicles. The preparation and processing of goods must be carried out while keeping delivery errors to a minimum. In addition to each staff member possessing the right skills, they must also possess mental flexibility and significant ability to adapt and react to changes taking place in a short space of time.

[9] Their use for several customers at the same time will enable the synergies offered by shared use to be passed on to customers, but they must also fulfill the functions that each customer demands of them. They must possess the necessary permits and be appropriately authorized and certified.

[10] This communication between the customer's and the TCLO's systems enables both to make direct use in real-time of all the information generated and managed during the logistical process. The TCLO's software must permit all the logistical management tasks to be undertaken and linked directly to the administrative and billing systems, as well as providing the statistics necessary for the measurement of service performance. It must also enable accurate stock levels of a particular item to be checked, provide information on where and at what stage each order is at any particular time, while also making possible the reporting, processing and monitoring of any incidents.

customer cancels the contract, the hub's geographical location no longer practical due to the difficulty in finding new customers able to use it. Therefore, site-specific resources can be classed as having a high intensity.

Finally, temporal specificities are crucial. In addition to the usual shipment protocol required for moving highly perishable goods in a time-sensitive supply chain, food shipments have limited shelf life and demand special handling, both in storage and in transport. Time lost in trans-shipment translates at best to a shortened selling window; at worst to dead inventory or unsatisfied consignees and consumers. For all these reasons, the timeframe for performing these tasks are important as penalties will be imposed if demands are not met. Therefore, there are two temporal specificities which have been characterized as being high intensity, given the importance they have for the companies interviewed.

Information Problems

The second contractual problem stems from the presence of *ex-post* information asymmetries. Conflict arises when TCLOs deliver products with lower than expected quality. Some of the causes are displayed in Table 2. Problems occur when a food company is unaware of the quantity and quality efforts made by the TCLOs. Although the final result is observable, this may have occurred through uncontrollable exogenous factors. Thus, the TCLO may be able to justify a poor result by alleging the problem and explaining the circumstances, but the food company is unable to verify the truth. Therefore, this element of the relationship must be contractually safeguarded in order to ensure that the transaction is protected from opportunistic behaviours which may manifest after the hiring has taken place. Firm managers need assurances that high quality standards will be met to prevent waste while logistics operators are equally concerned stimulating increased demand.

Table 2. Types of Incidents Leading to Interrupted Service

	Point of Origin	**Transit**	**Destination**
Manufacturer Errors	Poor identification		Incorrect address
	Poor packaging		Consignee refusal of the goods
	Defects in the goods		
	Not picked up	Accident on route	Late delivery
Operator Errors	Wrongly identified	Delays	Delivery to the wrong address
	Wrongly classified	Left in the warehouse	Incomplete delivery or damaged goods
	Product left at the warehouse	In transit	Non-delivery: loss, theft, etc.

Source. Authors' own based on the empirical evidence.

Contractual Problems and Appropriate Contract Choices

A key factor for companies migrating supply chain risk is to design contracts which will avoid problems regarding specific asset investment and ensure TCLOs provide the quality of service promised. The fieldwork reveals that the parties employ explicit and implicit contractual

formulas, but not with the same intensity, given that implicit contracts were more common. For only 36.4% of the food companies in the study secured a written contract[11]. In cases where explicit or formal contracts were used, four formulas were found to regulate the transactions: a long-term formal contract (10.9%, i.e. 6-food companies); a joint-venture contract (1.8%, i.e. 1-food company); an incomplete formal contract (16.4%, i.e. 9-food companies); and the use of an internal contract with provisions for haulage services in order to manage part of the production of outsourced goods combined with other options (7.3%, i.e. 4- food companies). In cases where the contracting was implicit (63.6% of the food companies studied), a verbal agreement was used. The logic behind all of these agreements is summarized in Table 3.

Long-term contracts[12] are used for outsourcing services, facilities or equipment for the exclusive use of the particular food company. The TCLO is required to make an investment in specific assets of such a size that the future continuity of the relationship must be guaranteed. Such an investment may involve a logistical hub, where management and electronic communication systems, facilities and human resources are made available to a single customer; or it may involve the creation of routes for a particular customer, with vehicles exclusively dedicated to them, etc. These are *dedicated specific* or *site-specific assets*.

The joint-venture contracts[13], found in the dairy product sector, are used when *temporal specificity* is important. Thus, joint-venture is employed for fresh products which have a very short shelf-life. Food with such characteristics requires sophisticated logistical networks offering temperature-controlled services with delivery timeframes of around twenty-four hours, with up to 50,000 places product delivery (not unusual for a market leader). This requires a highly strategic distribution system in order to maintain a certain level of control, thus food companies seek joint ventures with TCLOs capable of providing a range of services including: long-distance haulage, local distribution, product storage and order preparation. A joint venture contract helps food companies influence the management of logistics providers, thus ensuring quality control levels are achieved without having to deal with the rigidity of vertical integration.

While food companies may use TCLOs to supply some of their logistical needs, they may choose to fill a percentage of activities using their own internal resources, and drivers. In-house resources can be an efficient alternative when a firm's own less specialized resources do not justify the associated costs. Providing internal services makes sense with new customers or when local distribution networks are complex. It may involve delivering very small quantities of goods to multiple consignees, revealing a problem of high asset specificity. The study detected concern for new customers in the meat industry, while, in the sub-sector of frozen bakery products, the importance of an exhaustive local distribution network was also a factor[14]. When a new customer is contracted, it is especially important that the products arrive in pristine condition and transmit a sense of quality, both in terms product excellence and logistical efficiency. In the case of the

[11] This percentage is consistent with those found on the food industry (Jia and Huang, 2011; Abdulai and Birachi, 2009).

[12] When services are exclusively provided to a specific customer or the service provider must invest in equipment or facilities, the duration of the contract is usually set at two to five years. When the investments are highly specialized (such as a logistical hub for a single customer), the optimal situation is a contract for a minimum period of ten years.

[13] These are *ad-hoc* in nature, i.e. they concern a unique, particular area of business. They are therefore limited in time to the success or failure of the project for which they were created.

[14] It is worth noting that seasonality in production or consumption is not important in either case. If it were, it would not be profitable for the manufacturing company to maintain their own fleet of vehicles.

latter, a multitude of daily small-scale deliveries (supermarket and hypermarkets, traditional grocery stores, bakeries, cake shops, bars, restaurants and hotels) require a number of personal transactions and negotiation agreements increasing the odds of unforeseen or consequential disturbances prompting food companies to keep control in order to mitigate risk. In summary, the basic idea is to resolve a temporal specificity problem associated with product quality (the service is adapted to specific needs) and safety (the ability to guarantee the cold chain) demanded by consignees.

The incomplete contract[15], or "letter of agreement", is a document which records standard operational procedures that TCLOs must follow when providing services. It is a generic contract, adapted specifically to meet customer requests. Once the procedures have been accepted by the customer, the document is signed by both parties. It is used in cases where specific investments in dedicated or site-specific assets are not required, but in conditions of uncertainty and customer wariness. The signing of the contract provides customers an explicit safeguard, protecting them from legal action concerning goods. The need for explicit protection arise from the fact that the manufacturing companies supply goods to supermarkets, hypermarkets and other establishments operating on a zero-inventory basis, necessitating strict adherence to timetables for the receipt and unloading of goods. Consignees of this type are especially strict regarding the fulfilment of product delivery timeframes and impose financial penalties when requirements are not met. In this context, food companies want assurances they can transfer these penalties to TCLOs when the delay has been caused by the latter. This stipulation must therefore be agreed upon by all concerning parties and recorded in writing. Such contracts are also used when food companies agree to specific product pricing for volume goods, but wish to insert clauses so they can renegotiating prices should they subsequently want to increase delivery volumes. Obviously, this should be agreed to by concerned parties and recorded in writing. Therefore, a basic concern surrounds the lack of sufficient information to reassure the customer that the TCLO will defend the company's financial interests rather than its own.

In most cases, relationships are based on verbal agreements[16]. By using such agreements, food companies does not take on any obligations, ties or attachments to the TCLO. This means that food companies possess complete freedom to change operators[17], if it's in their best interest. Companies interviewed also stated that they use verbal agreements when transactions do not involve high-intensity specific investments. The lack of transaction details is a basic characteristic of verbal agreements and can cause problems resulting from unanswered accountability and risk. For example, a TCLO may expect a food company to provide a certain amount of goods to transport, but the latter may terminate the relationship after receiving a better offer. Or, the food company expects the TCLO to provide services, but the TCLO finds a better customer and fails to show up for scheduled deliveries. Given that no written commitment has been signed, parties may be more inclined to behave opportunistically when not suffering from penalties. In that case, how can informal compliance agreements be ensured? Empirical evidence shows that compliance levels are relatively high[18] due to inherent mechanisms which act to resolve problems. Those which are significant include: trust, reputation, the threat of relationship termination and repetition of transactions.

[15] The duration is open-ended.
[16] This makes it a spot market purchase.
[17] The main reasons for doing so are repeated deficiencies in the service provided and the price factor.
[18] For this reason, North (1990) refers to informal contracts as *self-enforcing contracts*.

Table 3. Specific Assets and Choice of the Contract

Type of Specificity	Associated Contract	Degree of contract integration within the company
Temporal specificity (consignee requirements)	Internal contract	Maximum
Temporal specificity (highly perishable goods)	Joint-venture contract	High
Dedicated assets	Long-term formal contract	Medium-high
Site-specific assets	Long-term formal contract	Medium-high
Physical assets	Incomplete contract Verbal agreement	Medium None
Human assets	Incomplete contract Verbal agreement	Medium None

Source. Authors' own based on the empirical evidence.

Conclusions

This study examined logistics outsourcing agreements in the perishable food industry, posing a series of propositions regarding the main factors determining contract choices. First, the influence of asset specificity on the use of explicit contracts was considered. Next, uncertainty was arise as a factor that increases the costs associated with the drafting formalized contracts, and the substitution effect that trust has when choosing between formal and informal contracts was also analysed. The comparison was made from a sample of 61 companies and 55 outsourcing agreements in force during 2011. The results identify a set of situations in which the spot market is inadequate and companies must use more complex coordination mechanisms in order to ensure that transactions take place at a reasonable cost. Two sources of conflict were detected using the hypotheses of contractualist theory. If the assets are adapted to the needs of the food company, both will suffer a loss if the exchange does not occur after the investment has been made.

The analysis of specificities reveals the existence of specific assets types. Human assets were of a low specificity, related to abilities, skills and awareness of those who must appropriately handle the perishable food details which are only useful for jobs related to products with those characteristics. Thus, specialized training was the most specific component of the human factor. Physical assets presented a medium-low level of specificity, mainly due to their capacity to provide refrigeration. The dedicated assets were more important. These concerned increases to previous capacity by which TCLOs make and are only useful to serving one particular customer. Typically, it is TCLOs which invest in physical and human resources needed to provide a service to a single customer, if the latter is large enough. Obviously, these assets will fall idle, at least in the short term, if the food company cancels the service. The same occurs with site-specific assets. When the TCLOs hub is located near the customer's premises, transport costs are lower, but the location descends in value when used to serve more distant customers. Finally, temporal

specificity is also decisive, when the most important attribute concerns the time. Perishable food and short shelf-lives demand that products get delivered quickly. When a commercial relationship is formerly established, a second source of conflict manifests itself when TCLOs provide services at a quality below that which was agreed. The cause of the quality-related problems resides in the information asymmetry existing between the parties: TCLOs possess more knowledge regarding the conditions by which the service is provided than its customers, who are unable to verify the level of quality until the exchange has already taken place and, if the customer is dissatisfied, determining whether the TCLO is ultimately to blame may not be an easy task.

These reasons explain why the parties need to safeguard resources in order for the transaction to take place, ensuring that asset specificity and information asymmetry does not lead to opportunistic behaviour. The results show that the parties employ explicit and implicit safeguards, although not with the same intensity, as implicit contracting is more widespread. In those cases in which explicit or formal contracts were used, four types of contract were found to regulate the transactions: long-term formal contracts, joint-venture contracts, incomplete formal contracts and internal contracts with which to manage a certain part of production in combination with one of the other options. When contracting was implicit, verbal agreements were used. The links are as follows:

a) Dedicated and site-specific assets are safeguarded by means of detailed long-term contracts. Complete contracts protect the financial investment made by the TCLO because the food company cannot rescind the contract without incurring costs; the penalty represents compensation to the TCLO for the damage caused by the unexpected termination of the relationship, given the specificity of the investment made.

b) When the significant specificity is temporal, associated with the highly perishable nature of the products, the companies employ joint-venture contracts because the timeframe of the logistical operations is a key factor for the food companies.

c) When the problem concerns the need to closely monitor all of the quality-related attributes of the product in order to comply with the consignees' requirements, the food company faces a situation in which it cannot allow errors to occur in the provision of the service as the costs of this taking place would be too high (the loss of customers, for example). The method chosen to achieve this is simply for the company to carry out these activities itself, using internal contracts for the management of that part of production which is subject to rigorous demands from the consignees. The goal is to resolve a problem of temporal specificity associated with demands made by the end-customer related to quality (the service is adapted to specific needs) and safety (in order to ensure the cold chain).

d) Incomplete contracts are signed when no specific asset plays an important role but the food company needs to protect the financial conditions of the agreement in a situation of information asymmetry, which may discourage the TCLO from defending the economic interests of the customer rather than its own. It is for this reason that, although contracts of this type are not detailed, they do allow for relevant particular conditions to be

included in the agreement (financial penalties, renegotiation of prices due to increases in volume, etc.).

e) Verbal agreements are used in situations in which there are not specific assets and a written document is not deemed necessary to protect the economic conditions of the agreement. How can the information problems be resolved? This contract works on the basis of the implicit trust-based mechanisms ensuring fulfilment: the food companies rely on the fact that the TCLOs are concerned with maintaining their reputation and this encourages them to act in the most favorable manner with the customer, without the need for a formal contract.

The empirical evidence associates long-term formal contracts, joint-ventures and internal contracts with a particular specificity, and incomplete and verbal agreements with information problems. However, the theoretical framework does not show that a direct relationship is necessary, nor does the secondary evidence provided by other authors[19]. The latter suggests the existence of organizational options other than outsourcing which can also be of use when seeking to protect high-intensity specific assets. Then, when considering the relationship between the TCLOs and the food companies, it can be seen that the connection between the type of contract binding the parties and the type of specificity of the assets in question intensifies. This suggests that not only is that level of specificity as the explanatory variable important, but also that the type of specificity has some significance. In this sense, the study supports the importance of specificity problems and moral hazards as the main explanatory factors in the choice of contract and points out that the firms involved are typically involved in several different types of relationships and they are handling multiple types of specificity simultaneously. These problems are significant with perishable food products, they can be of different types and the impact they have can vary depending on the company concerned, leading to the existence of different transaction governance structures.

The above results lead us to conclude that the more integrated in the company is the contract, the contractual problem which the contract is to address is most relevant to the company[20]. This enables contractual problems to be ordered in terms of their importance to the parties. In this way, the top-ranked problem would be the temporal specificity associated with the demands of the consignees, as this is linked to internal contracts. In second place is the temporal specificity associated with the highly perishable nature of the product, compelling the manufacturing company to maintain control over the management of the logistical activities by setting up a joint venture. Third are the specificities of dedicated and site-specific assets, which enable the outsourcing of the logistical services by means of a formal long-term contract. These are followed by economic information problems which are associated with formal but incomplete contracts. Finally, are the information problems related to the inherent quality of services provided, and these are resolved informally without the need for the signing of a contract.

[19] Masten, 1996.
[20] This relationship is consistent with the findings of other studies, especially with those concerning the same industry (Arana *et al.*, 2013; Bakucs et al. 2013).

We would like to highlight some outcomes and strategies that food manufacturers can use when contracting services offered by TCLOs:

1. Logistics outsourcing entails significant difficulties affecting competitiveness. The situation particularly serious in the perishable sector, whose characteristics are highly sensitive to handling required. Consequently, food companies must properly select the TCLO they hire.

2. Given the problems associated with failures in service, food companies can negotiate more complete contracts that act as a safeguard against possible breaches of the TCLO.

3. Companies must be able to handle different types of government responses simultaneously; this will give them opportunities to improve product distribution and adapt to the specific needs of their customers and achieve cost reductions.

4. Food companies should know that the pricing strategies of TCLOs are different depending on the type of contract (formal or verbal).

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The Case of Valldal Branded Strawberries

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Abstract

Valldal is a small township and valley in the picturesque fjord district of western Norway. The case concerns the current management of Valldal Grønt, a small farmer-owned cooperative recovering from a harsh winter that destroyed much of the strawberry production it depends on for its livelihood. Although Valldal Grønt has successfully branded its products, in these times of diminishing production and profitability, the brand equity is under siege. Farmers now seek a leaner organization. Simultaneously, pricing issues are subject to scrutiny and souring business relationships with customers. Valldal Grønt continues to use information technology to better coordinate the supply chain with the daily variations in supply and fluctuating demand. The case illustrates how branding is embedded in an end-to-end supply network and its natural environment. This case is intended for students following courses in supply chain management (SCM) & logistics, operations management and industrial marketing.

Keywords: fresh strawberries, Norway, branding, supply chains, integration, risk management.

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IFAMA Agribusiness Case 18.4A

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Introduction

Harald Valle is the Managing Director and the sole full-time employee of Valldal Grønt AS[1], a farmer-owned cooperative in Valldal, a village located in the Norddal municipality[2] of Norway. Strawberry production historically plays an important role in this township and is so important that the strawberry is the main feature of the municipality's shield.

Exhbit 1. The Norddal Municipality Shield

During the brief summer seasons lasting approximately six weeks, Valldal Grønt purchases raw materials from 25 different local farmers. These goods are collected at farms, received, processed, packaged and distributed. The company is a trading intermediary and an important inbound logistics coordinator for both the farmer and customers. About 75% of the product is frozen providing year-round distribution activities. Harald Valle has been working with the company since 2004. He's acquired high-level management skills through negotiating with farmer-owners, customers and managing the flow of strawberries through the firm. He has especially focused on developing "Valldal" as a brand to differentiate the market position of their products to improve the profitability of Valldal Grønt AS.

Branding "Valldal"

Harald Valle's primary concern is marketing strawberries from Valldal and believes successful marketing sustains strawberry production and logistics. Shortly, after joining Valldal Grønt, one of Valle's first tasks was to create a new logo for the company. Bragd AS, a reputable communication agency was tasked with the logo design. The development took time and was supported by the Norwegian government through the food program channeled through the business development agency, *Innovasjon Norge*[3] Several components encapsulated the development of the Valldal Norge brand: (1) Valldal is a major regional tourist destination. (2) It is located in the picturesque fjords region of northwestern Norway. (3) This area promotes itself as the "strawberry valley".

Valldal Grønt gradually achieved success in developing a national "Valldal" brand in the five years leading up to 2015. They created a website to manage their reputation for both business customers and end-users[4]. Valldal Grønt AS has developed a range of consumer packed frozen berry products that are manufactured and distributed in several packaging sizes. Harald Valle has been instrumental in initiating branding efforts with industrial food processors. Typically it is the food manufacturers that initiatives the efforts to combine the Valldal Grønt logo with their products.

[1] www.valldal.com
[2] www.norddal.kommune.no
[3] http://www.innovasjonnorge.no/no/english/#.VMc1qP6G_Ac
[4] http://valldal.com/

Exhibit 2. Harald Valle, Managing Director of Valldal Grønt AS with a distribution crate of Valldal Strawberries

The Products

Raw strawberries are transformed by the producer's cooperative into three product groups for: 1) industrial users, 2) consumers, and 3) hotels-restaurant-catering (HoReCa). Fresh berries for consumption are packed in 500 gram baskets, 12 baskets placed in distribution-level carton-type packaging (40 cm. x 60 cm.) with 40 distribution crates on a Euro pallet (80 cm. x 120 cm.) representing the standard “pallet” volume. Plastic baskets are stamped with a logo reading "Valldal". While most baskets used to market strawberries in Norway are colored, the Valldal brand strawberry product has experimented with see-through plastic baskets and lately, Valldal Grønt uses the Bama standard black plastic baskets. The carton also clearly displays the name of the supplier. The choice of design and branding baskets as well as applying new sizes, such as a new 300 gram basket, are some of the many tasks that concern Harald Valle.

Exhibit 3. Valldal branded frozen strawberries and ice cream branded ingredients from “Valldal”

Consumer-level packed frozen products are branded as "Valldal". Furthermore, a dominant Norwegian ice-cream manufacturer, Diplom-Is, has used "Valldal" on its labelling of high-quality naturally flavored ice-cream products. The packaging reads *"Ekte norsk fløteis med rørte jordbær fra Valldal"* meaning real Norwegian ice cream made from home-made style stirred strawberries from Valldal.

Brand development is also achieved through distributing Valldal Grønt fresh seasonal strawberry products to the up market restaurant chain Pascal in the Norwegian capital city Oslo. The restaurant's menu explicitly states that some items feature strawberries from "Valldal". Valldal Grønt plans to widen this mode of distribution by sending products to Oslo during the season to up market HoReCa businesses and selected delicatessen stores. In 2014, Valldal Grønt signed an agreement with Tine, the dominant dairy product producer in Norway with a 90% market share, to distribute yoghurt products bearing the Valldal brand.

Exhibit 4. The Valldal Tine Yoghurt

Valldal Grønt has a strategic partnership with Bama, a fruits and vegetables wholesaler, who is increasingly promoting local foods. However, they are unsure as to whether locally branded strawberries work well in all cases. According to Harald Valle, Valldal Grønt's is the only locally branded strawberry product that is appreciated outside the regions in which they normally distribute due to their long-term branding efforts.

The Farmers and Their Company Valldal Grønt AS

Established in 1998, Valldal Grønt AS, is a private company limited by shares owned exclusively by strawberry growers. It is an agribusiness cooperative founded to increase productivity in strawberry production and distribution. The strawberry growers took the initiative to build the business assisted by consultants provided by the municipality. Help was needed to develop the organization. Valldal Grønt AS aimed to secure the marketing and sales chain for products produced by its owners. It operates a combined production, terminal and storage facility for mainly strawberries in the center of Valldal. It also organizes two annual meetings with growers to inform them about strawberry production, distribution, and facilitate contact among strawberry growers. These meetings occur before, during and after the growing season and always with Harald Valle present.

Exhibit 5. Strawberry farmer and local politician Audun Skjervøy from Valldal. One of Valldal Grønt's owners.

In addition to Harald Valle there are several part-time employees at Valldal Grønt AS. The cooperative employs one administrative employee who works 75% of the year on a full-time basis; accordingly two production workers who work full-time, respectively 80% and 60% of the year; and a part-time cleaning assistant. Valldal Grønt AS also hires seven full-time production workers every season and 25-30 production workers who help during the peak harvest period. Harald Valle's annual workload fluctuates throughout the year with long work hours beginning just before the season begins and slowing down as the strawberry harvest gradually comes to an end. The rest of the year, Harald Valle works on company strategy and prepares for the next seasonal harvest which normally begins in mid-June. The start dates and production volumes of the growing season fluctuate year-to-year a due to weather conditions.

Farmers in Valldal are small-scale growers, usually managing and operating farms on a part-time basis. During the season, however, strawberry production demands a large amount of pickers and substantial administrative effort. A typical Valldal strawberry grower operates 20 dekares of strawberry fields. Picking strawberries is a manual task carried out by migrant labor predominately from Eastern Europe. On average one hectare of strawberry field requires of 10 laborers. This means that a grower operating 20 dekares of strawberry field needs 20 pickers and housing for the season. Farmers need to comply with rules regarding housing standards. Facilitating migrant labor is therefore a substantial investment for farmers.

Exhibit 6. The upper picture shows the village of Valldal in the fjord region on the west coast of Norway. The Lower picture shows a close-up of the Valldal Grønt production and warehouse facility.

The Business of Strawberry Production

Prior to harvest, strawberry production involves a complex combination of measures to secure both short-term strawberry growth for each season and a longer term component comprising product and farm facility development. The distribution of strawberries as a commercial item starts accordingly with harvesting. All strawberries in Norway are seasonal and open-air harvested due to the Nordic climate that limits agricultural production to the summer-centered growth period.

Types of Strawberries

The "strawberry" has a number of different cultivars (varieties) permitting strawberries to be grown in a large range of different agricultural conditions as well as varying in durability. Strawberries are relatively expensive to produce since production is technology-intensive and has until recently been distributed in primarily economically developed countries. This is changing as many developing countries are starting to produce strawberries for fresh upmarket domestic consumption as well as exportation of durable varieties such the El Santa.

Exhibit 7. Norwegian strawberry retail business
Photo: Vegard Grøtt / Scanpix

One desirable indicator of strawberry cultivars is their degree of firmness. Firmer strawberries are more durability after harvesting. Removing the stem from strawberries also reduces their durability. In Norway, due to its northern geographical location, strawberry production is seasonal. The most common type of strawberry produced in Norway for fresh consumption is of the Korona cultivar. Valldal farmers have chosen to grow another cultivar—the Polka. This strawberry is slightly firmer and darker in color than the Korona berry. Due to increased firmness, the Polka strawberry has up to 72 hours durability compared with the Korona's 48 hours. However, the main reason the Polka was chosen, is because this cultivar is well adapted to the specific growing conditions in Valldal.

In the last few years, Valldal Grønt has gradually started using the Florence strawberry, first introduced during the 2011 growing season, representing 10% of the fresh strawberries packed into baskets for consumption, with Polka filling the remaining 90%. This variety ripens later than the Polka and withstands the colder late-summer Norwegian climate better, thereby extending the end of the growing season. While the Polka represents about 40% of the produced volume in the studied valley, the remainder consists of the Senga Sengana type strawberry. This cultivar has been used in Norway since the 1960s and was previously used for fresh consumption. Currently, Senga Sengana is predominately used as raw material in industrialized food processing.

Due to the Norwegian government protectionist measures, it is far cheaper for industrial customers to purchase Norwegian strawberries than import strawberry products. Demand for Norwegian produced strawberries is therefore unlimited. Costs associated with producing and distributing strawberries in Norway is also high. This is generally due to the high costs of living in this country. However, Norwegian consumers have strong purchasing power because of their higher standard of living. Valldal Grønt has also increasingly diversified and is now producing 25 tons of raspberries. These berries are harvested after strawberries, thereby prolonging the season and securing better use of migrant labor. Valldal Grønt also changed its distribution of

consumer packed frozen strawberries. They now sell products produced in accordance with orders from Norrek Dypfrys AS, a specialized producer of frozen berries. These products are also branded with the Valldal logo including the "Nyt Noreg" generic brands that emphasize Norwegian produced foods. Norrek Dypfrys AS also produces private brands of strawberries for other supermarket suppliers. For Valldal Grønt this implies simplified sales and marketing of these types of products since they now have only a single customer who is responsible for the distribution to retailers in Norway.

Exhibit 8. Frozen strawberries produced by Norrek Dypfrys AS

Farming Strawberries

A range of factors impact harvest quality and quantity. Colder weather slows plant growth. The age of the plants also affects strawberry yields. Rain deteriorates product quality, and when rain is a factor, daily harvests of strawberries for fresh consumption have been reduced by as much as 80% for the entire studied region. When rain is a factor, pickers are then directed to harvest them for industrial use. Strawberries designated for industrial use are a lower quality. Other major threats to strawberry production include soil deterioration and insect attacks. Growing strawberries in the same fields year-after-year eventually depletes soil quality. In order to replenish the soil, fields are rotated and used to grow grass for animal feed or other soiling enhancing crops such as potatoes. In the studied valley, specialization which becomes too focused on strawberry production becomes a threat. Insects attacking strawberry plants are another threat that has reduced harvests up to 80% in certain strawberry fields. This risk has been controlled through precautionary measures which includes the use of pesticides.

Exhibit 9. Picking strawberries in Valldal

By introducing the Florence type strawberry, Valldal Grønt has been able to extend its growing season for fresh seasonal strawberries by a few weeks. Price increases coincide with the end of the Norwegian growing season. This provides an opportunity to increase profits. According to Valldal Grønt, their primary challenge is to increase the total volume of strawberries produced. The demand for frozen strawberries from Valldal Grønt's perspective is inexhaustible, and the seasonal fresh strawberry demand is also relatively unlimited. Thus opportunities exist to distribute fresh products into neighboring regions and start production in neighboring locations such as Stordal, Vaksvik, Hellesylt which have growing conditions similar to Valldal.

A dekare is a metric system measurement for land volume and comprises of 1000 square meters, approximately 0.25 acres. While the average dekare of production soil yielded 1800 kilos per dekare a few years ago, at present a dekare yields less than 1000 kilo. This is a result of increased limitations in use of pesticides as well as strawberry beetle contamination. Beetle attack is difficult to control and a development priority. There is consideration using irrigation schemes to cope with the strawberry beetle by disturbing its habitat. A major threat is harsh winter conditions. The winter of 2012-13 was extremely cold accompanied by drought. There was therefore no snow to naturally insulate the strawberry plant during this harsh winter. A majority of the strawberry plants perished, especially the Florence plant. While production of Valldal strawberries normally ranges from 500 to 600 tons annually, the harvest in 2013 was a mere 118 tons. Since the harsh 2013 winter farmers have been protecting the strawberry plants with plastic coverings on the ground than insulate the plants during cold winters. In 2014 this harvest had increased to 260 tons due to planting new strawberry plants the preceding year. In 2015 the harvest is expected to be 450 tons. This slow progression is due to that it takes a year before the strawberry plant bears fruits the first time. Harvested product quality is best during the first year. Volume is, however, low. The peak volume is reached in the plant's third year, and the fourth year is its last year of production normally. In addition, an annual season may start earlier or later due to weather conditions impacting on the start, length and volume of production in season. Also the total harvested volume may vary by 20% on a seasonal basis. The daily volume of strawberries designated for fresh consumption fluctuates from day-to-day due to weather changes. Average production per dekare in Valldal the last years is shown in Table 2:

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Table 2. Harvested volume in kilos per dekare (approx. 0.25 acres) by farms supplying to Valldal Grønt.

Year	kg/da
2008	1260
2009	1052
2010	842
2011	924
2012	1271
2013	404
2014	670

If you ask a farmer they will most likely state that they are satisfied with a harvest of 1200 kg/da. Some farmers have managed to create a yield of 1500 kg/da.

Exhibit 10. Harald Valle visiting producers during harvest

The Supply Network

The main company actors involved in the "normal" Valldal Grønt supply network of fresh seasonal strawberries is shown in Figure 1.

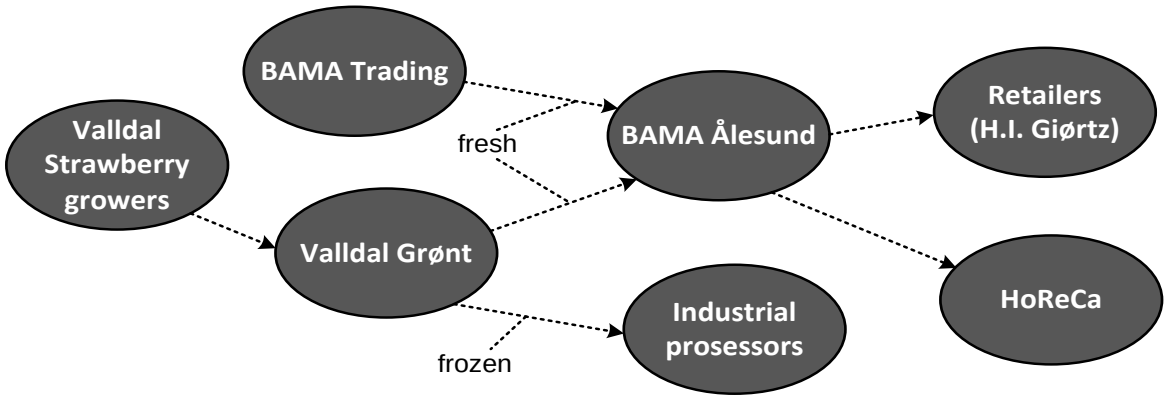

Figure 1. The flow of goods and supply network actors involved in strawberry distribution from Valldal.

Norway's leading fresh produce wholesaler, BAMA Group AS has 21 distribution centers across the country[5]. The BAMA Group distributes products exclusively to retailers within NorgesGruppe. BAMA Ålesund, the Bama distribution center for the wider Sunnmøre region, where Valldal is situated also distributes its products to HoReCa (hotels, restaurant, catering) market. H.I. Giørtz & Sønner is the regional distribution center of NorgesGruppen in the Sunnmøre region. In this region the market share of NorgesGruppen exceeds 50%. H.I. Giørtz holds 33% ownership of BAMA Ålesund. The rest is owned by BAMA Group[6]. A variety of supermarket chains with competing market positions make up the dominant NorgesGruppen.

Recently, Valldal Grønt decided to invest in new equipment to produce frozen products. By cooperating with a regional specialist in industrial convection technology, Øen Kuldeteknikk (www.kuldeteknikk.com) established a company together with the Norddal municipality in order to supply Valldal Grønt with the freezing capacity needed for their seasonal and municipality buildings in Valldal (the municipality center) and with heat need during the rest of the year. Through this partnership, their estimated investment was reduced from an expected 12 million NOK to 5 million NOK. The convection machinery is located adjacent to Valldal Grønt's production facility, which suggests a widened supply network not directly associated with product distribution.

The flow of different strawberry goods including variation types and packaging managed by Valldal Grønt AS prior to the harsh winter in 2013-14 is illustrated in Figure 2.

[5] Data 2009. www.bama.no
[6] www.bama.no

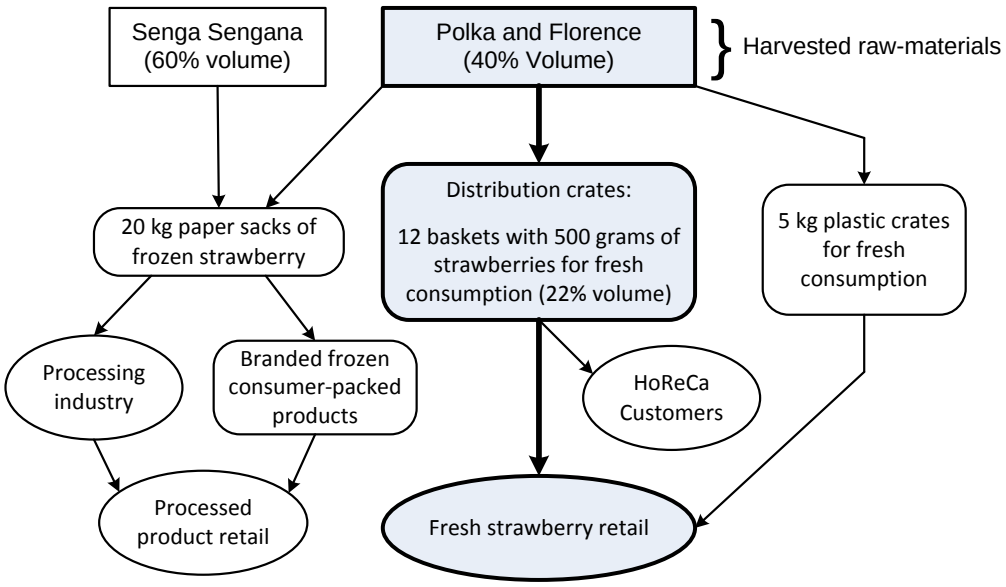

Figure 2. The flow of fresh strawberry products through the retail chain administered by Valldal Grønt.

Replanting has focused on the Polka variety. In 2014, 90% of production was Polka and 10% Senga Sengana. The Senga Sengana species will eventually be terminated. Fresh strawberries for consumption are distributed in 4kg plastic crates. Stems of the berries are removed. This product consists of slightly smaller Polka strawberries. These products are purchased by households to be frozen or used in home-made jams. Products for industrial production are frozen and packed in 25 kilo paper sacks.

Strawberries for fresh consumption are packaged in clear (500 gram) plastic baskets then placed into carton crates containing 12 baskets. Strawberries for industrial use are picked in larger plastic baskets that are emptied into plastic crates. Fresh strawberries in 5 kilo crates, and the industrial-purpose strawberries, are treated in the same manner during harvest and in production prior to freezing. Only strawberries of the Polka cultivar are used for fresh consumption. These crates are collected in central position on the farm.

Early in the season, two runs are made by two trucks operating separate routes. In the peak season, an additional truck is added to handle the increasing supply. There are two different routing schedules, one used during the peak season and another for the period prior to and after the peak. The growers' cooperative annually produces about 600 tons of strawberries at its facility with a capacity of 800 tons. About 120 tons are designated for fresh consumption and in this case the facility functions only as a terminal. The daily flow into the growers' cooperative ranges between 0-65 tons per day. The average volume during the season ranges from 40 to 50 tons. This facility also distributes other types of fruit and berry products and has the capacity to produce, store, and handle other fruits and berry products.

Approximately 75%, of the fruit sent to industrial food processors is used to make juices, jams and flavor additives for products such as ice cream and yoghurt. Production of consumer-packed frozen strawberry products accounts for less than 10% of the total volume harvested. Less than

20% of the fresh strawberry production is distributed in-season through retailers to consumers. Most of the fresh strawberries for consumption are transported daily to the wholesaler's facility. The growers' cooperative also sends fresh strawberries to retailers in the southern region through an agreement with the regional fresh fruits and vegetables wholesaler.

At the growers' cooperative facility the main volume of strawberries for industrial purposes are processed at the same time as a limited demand for 5 kg. crates packed for fresh consumption. These products have their calyx removed during picking and are destined for households making traditional home-made preservatives such as jams and jellies or frozen sugared berries. The process involves cleaning, freezing and packing. This production takes place only during the strawberry harvest.

Communication Flow

During the season, the volume of harvested strawberries fluctuates day-to-day. Valldal Grønt AS, manages this flow of goods, and farmers are expected to notify them with daily harvest estimates by mid-afternoon on the day prior to the harvest through SMS messaging. This information is conveyed to Bama Ålesund, who then prepares coordinating orders of strawberries with supplies. Estimates are measured in the number of pallets. The next day projections are further updated by midmorning. Final numbers are tabulated from individual growers as the pallets are picked up in the afternoon. This information also specifies which variety (Polka or Senga Sengana) is planned for harvest. The information collected from first estimates is also forward to the regional fresh fruits and vegetables office informing them the volume of fresh strawberries they can expect to receive on the following day. Information is updated as more exact figures become available. In 2010, the growers' cooperative started using an automated production monitoring system where growers are able to log into a webpage and report their anticipated and actual production volumes. This system is used by growers to keep themselves updated on deliveries, and is also to purchase needed equipment and strawberry plants. The automated system allows instant access to account information spanning each day of the season. Although the system is fully functional, only two of the 25 growers actually use the system to report daily production during the season. Presently, all but one of these producers have internet.

Retailers simultaneously send daily orders for fresh fruits and vegetables products to the regional fresh fruits and vegetables wholesalers. A relatively fixed amount of fresh Norwegian strawberries is expected to be sold daily for consumption. Medium-sized supermarkets in the local region typically order six crates of strawberries, five times a week. The soonest retailers can expect deliveries is the following day. Weather conditions strongly influence demand. Sales of fresh strawberries may double on a sunny day and are highest on Fridays and Saturdays. Orders are submitted in the morning prior to delivery day. Each product has a numerical GTIN code used for logistics tracking. A hand-held digital scanning device is used to create orders and information is sent directly to the regional fresh fruits and vegetables wholesaler. Orders from HoReCa customers are also received by the wholesaler, although this is a relatively smaller volume. The regional fresh fruits and vegetables wholesaler uses Excel spreadsheets to compare order information with supply information.

The task of the regional wholesaler is to either push excess amounts of strawberries onto the market by calling purchasing vendors at the retailers, and suggesting price reductions to facilitate purchases of larger volumes. In some cases price promotions are planned in advance among specific differentiated supermarket chains within the focal retailer group. In cases of demand exceeding supply, such as when it has rained the day before, the regional fresh fruits and vegetables wholesaler needs to first attempt to find supplies from other regions. If the demand still may not be met, the regional fresh fruits and vegetables wholesaler representatives call the retailers and inform them about the quantities they actually will receive the following day.

Quality discrepancies are sought avoided through inspections at the different facilities in the materials flow. Inspections involve primarily measuring the temperature of the products combined with a visual control. In cases of quality discrepancies, product traceability is provided by markings on the crates. This information allows the identification of the farm, the picker and the time of harvest. Complaints are usually communicated by telephone. This may in some cases involve communicating by telephone sequentially through the entire chain, from retailer, through Bama Ålesund and Valldal Grønt AS, to finally reach the farmer.

Pricing Strawberries

Strawberries are relatively expensive commodity-type agricultural products with relatively costly production and distribution activities. At the retail facility baskets of strawberries have a profit margin of about 15% compared to 20-30% for most other fruits and vegetables products. This is countered by the large volume of strawberries, and that these are products that usually easily sell out when in supply. In addition, retailers express that when in season, consumers expect the store to be able to provide this product. In Norwegian food culture fresh strawberries for consumption are interwoven with consumer perceptions of “summer”. The downstream part of supplies is relatively integrated due to a combination of ownership-based ties (vertical integration) and long-term contracts. The cooperation between the growers’ cooperative and the regional fresh fruits and vegetables wholesaler has lasted more than 10 years based customary renewed annual contracts.

Prices of industrial products are set annually in centralised negotiations. A national growers’ cooperative negotiates with different industrial customers. This represents what is commonly termed by industrial actors as the "market price". One of the main challenges facing Valldal Grønt AS is actual pricing the products, especially for household consumption of its fresh products. Prices of strawberry products for industrial delivery are usually somewhat lower than that of supplies for fresh consumption. A price per kilo is negotiated for the products between the growers’ cooperative and the regional fresh fruits and vegetables wholesaler. Valldal Grønt As is a small market player in the total Norwegian fresh seasonal strawberry market, responsible for only a fraction of this form of supply. BAMA sets its prices on a national basis through registering fresh strawberry market price fluctuations involving also the other major Norwegian strawberry distributors. Harvesting commences later in Valldal than in the dominant eastern parts of the country. BAMA has a dominant position with approximately 80% of all distribution of strawberries to retail chains in Norway.

Being a relatively late entrant on the national Norwegian strawberry market, when strawberry harvesting commences in Valldal, strawberry prices on the Norwegian national market for fresh consumption are already at a relatively low level. This is about 2-3 weeks after the earliest fresh

strawberries have been harvested in greater volume in Norway. To cope with this, in June 2004 Valldal Grønt decided to establish its own sales organisation Valldal Bær AS (bær = berries) marketing its fresh consumption strawberries to customers not affiliated with NorgesGruppen serviced by BAMA Ålesund during the 2005 and 2006 seasons. This distribution practice continued until Valldal Grønt came to agreement with BAMA Ålesund, that allowed them to set a unique product (Global trade item number – GTIN, www.gs1.org) code on the fresh seasonal Valldal Grønt strawberry product. This practice was facilitated by a then initial stage marketing effort differentiating Valldal fresh consumption strawberries through baskets carrying the "Valldal" logo.

The solution also involved a seasonal contract negotiated by Harald Valle with the manager of BAMA Ålesund regarding a fixed price. Informal pricing arrangements were then still in practice. The fixed price could e.g. be negotiated within the limits of an overall expected turnover. This meant that a lower price could be agreed upon such as in the case of large harvested daily volumes or planned promotion campaigns on certain deliveries if a later higher price was agreed upon. At the end of the 2008 season prices had proven to be higher in the past years than the negotiated price. It was therefore decided to use the national market price mechanism in the 2009 season. This year, however, weather conditions in the main Eastern Norwegian production areas was exceptionally good providing large volumes at the start of the season. This gave prices in the beginning of July 2009 that actually at times was lower than for supplies to the contractually-based deliveries for industrial purposes. Simultaneously, some retailers sell strawberries at a loss to attract customers. These are usually planned campaigns administered by supermarket chains within the focal retail group. After the 2009 season it was decided to return to the earlier fixed price agreement. The supermarket chains in NorgesGruppen plan product promotional campaigns relatively likewise for all their products. Furthermore, while supermarket chain strawberry promotional campaigns are planned many weeks in advance, actual harvesting volume does not always produce the necessary planned volume due to weather conditions.

Exhibit 11. Strawberries on sale at a Norwegian supermarket

Current Business Challenges for Valldal Grønt

After a harsh winter in 2012-13, Valldal Grønt has been unprofitable. Being a Norwegian firm, Valldal Grønt's uses the Norwegian krone (NOK). In mid-2015 the exchange rate for NOK was approximately 7.70 NOK for 1 USD and approximately 8.20 NOK for 1 EUR. In 2013 Valldal Grønt lost 2 million NOK. In 2014, losses are expected to total 1 million NOK. The equity of Valldal Grønt will be at around 0 NOK. Valldal Grønt is budgeting profits of 0.5 million NOK in 2015. Consequently, three employees had work hours cut by 50% from October 2013 to April 2014. Harald Valle took a voluntary leave of absence from November 2014 to March 2015. Valldal Grønt AS also succeeded in receiving a research grant associated with increasing berry production from the Norwegian government which allowed him to commence working full time in February 2015. These cost-saving measures also reduced administrative capabilities. However, Harald Valle, an energetic entrepreneur, secured government support through an agro-technical research project aimed at increasing the volume of production supplying Valldal Grønt with raw strawberry material.

Table 2. Accounting figures from Valldal Grønt AS by years in Norwegian kroner (NOK).

Year	2002	2008	2012	2013	2014
Income	20,490,357	23,356,460	29,626,111	10,869,516	15,587,093
Costs	20,050,345	22,407,963	27,595,067	15,704,831	11,988,773
Profit	440,012	948,496	2,031,044	-1,119,258	-117,738
Total assets	9,642,181	9,736,643	10,097,250	15,937,986	15,409,889
Equity	258,075	874,967	1,410,150	703,910	-99,117

Note. Income, costs and profits are associated with management accounts exempting the financial results.

Exhibit 12. Winter picture of strawberry plants 2013
Photo: Hegelin Waldal

Since the harsh winter in 2012-13, the farmers who own Valldal Grønt, are increasingly calling for Valldal Grønt AS to be downsized into a purely seasonal business operation. This would require restructuring the cooperative to provide only the most basic forms of trading, logistics, and production and remain active only during a slightly longer harvest season. This strategy is still being cautiously brought forth by the growers but the sentiments are real and need to be addressed by Harald Valle.

After a delegation of four executives representing Tine (dairy); Coop (retailer); Røra Fabrikker[7] (Fabrikker = Norwegian for factories) a coop-owned producer of the fluid strawberry substance for industrial use; and an advertising agency visited Valldal Grønt to prepare for production of the new Valldal branded yoghurt, some producers asked Harald Valle if they would get an immediate better price for their products. Harald Valle feels accordingly his long-term effort to develop "Valldal" as a branded product is gradually weakening among the producers since the harsh 2012-13 winter and the following 2013 poor harvest since new strawberry plants may not be harvested the same year they are planted.

Prior to the 2014 season, however, BAMA Ålesund was notified by BAMA central that the expected supply of strawberries for fresh consumption would increase from 2500 tons to 5000 tons at a national level. Expecting a large surplus of supplies, BAMA Aalesund refused to contract a fixed price for the 2014 season. Valldal Grønt AS therefore decided to distribute as much of their strawberries directly to the supermarkets themselves. Harald Valle hired an assistant to carry out general administrative work including handling supplier relations. He then focused on selling products to retailers in the region. During the season Valldal Grønt had three vans distributing their products. Retailers then received their products less frequently; two or three times a week.

The market gradually expanded since retailers who were not receiving Valldal Grønt's strawberry product learned through word-of-mouth that Valldal Grønt was distributing its products directly. These retailers were missing their branded Valldal strawberries. Instead they were often selling strawberries from other regions which meant longer transportation time and therefore a lessening degree of freshness. The price was also lower than that of BAMA. In addition, while the previous fixed price during the 2013 season was 19.25 NOK per basket, Valldal Grønt was charging 26 NOK for strawberry products to its retail customers. BAMA Ålesund was therefore in a difficult situation, losing out on its strawberry orders since an increasing amount of retailers were preferring to purchase directly from Valldal Grønt AS, and at the same time struggling to find alternative supplies, since the surplus supplied by Valldal Grønt AS to BAMA was far less than demand. At the end of the season BAMA Ålesund made it clear that for the next year's 2015 season they would agree to a fixed basket price of Valldal Grønt supplied strawberry products.

What's Next for Valldal Grønt?

Harald Valle must address the fact that the assets of Valldal Grønt AS are gone. In 2014, the economic trend is slowly improving and expected to continue, but nowhere near where it was prior to the winter of 2013. The 2015 season got off to a slow start as June and July were very

[7] https://coop.no/om-coop/virksomheten/coop-norge-handel-as/as-rora-fabrikker/

cold and wet months. In mid-August, the weather abruptly improved bringing dry and warmer weather. This led to a late start. The 2015 season began with small daily harvests as the weather suddenly improved. With warmer temperatures, the daily harvest volumes grew, prolonging the season. However, the delayed harvest took place at a time when the strawberry season had normally ended. Consumers didn't seem to mind, and demand was still good as supplies picked up. The case reveals how vulnerable Valldal Grønt is to the basics of weather conditions and insects at a seasonal level and volume variations at a daily level during the harvest. Even though Harald Valle has spent much time and effort building a modern, locally branded agricultural product, this has not helped Valldal Grønt AS in tackling the realities of being a producer and distributor of a vulnerable agricultural commodity. The owners of Valldal Grønt AS seem to be panicking due to fundamental economic concerns. They therefore express a desire for Valldal Grønt to be transformed into an organization that can better handle the clearly pertinent issue of managing risk associated with environmental factors. According to this view, Valldal Grønt As should focus on production and strawberry goods delivery. Due to the limited managerial resources, Valldal Grønt AS has some very important strategic decisions to make.

Fundamental trading activities carried out in the season are regarded as less risk-prone than risks associated with environmental concerns. The case also identifies several incidents in which the business relationship with Bama is not straightforward. Pricing strawberries is not simply a matter of floating the product into the marketplace but subject to decision-making and contracting that occur in the business relationship between Valldal Grønt and Bama Ålesund. A major strategic decision emerges therefore regarding whether Valldal Grønt should reduce its managerial capabilities and focus on securing profits through a weaker trading organization. This option leaves in the open how the farmers may collectively improve their resilience in face of environmental concerns as well as the threat of increasing imports of potentially better quality and more competitive prices. Given the small size of Valldal Grønt AS, and that it is owned by farmers located in close vicinity to where Harald Valle has his office, discussions are many and relatively transparent. All the farmers are indigenous to Valldal and know each other well. Important formal strategic decisions are therefore debated and made by the general assembly of the firm and are not left to the board of directors. Harald Valle plays a key role in organizing this strategic debate and decision-making.

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Red Arrow Products Smokin' Into the Future: Facing Changing Diets and New Challenges in the Food Industry[1]

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Abstract

This case study is intended for use by undergraduates studying agribusiness and agricultural economics. The case introduces a firm whose products are minor ingredients for an iconic, but declining food item. The learning outcomes sought from this case is to: i) understand the structural changes in the meat industry and its implications on the production and demand for hot dogs; ii) examine the sources of competitive advantage faced by ingredient suppliers; and iii) analyze the elements of organizational change and the adaptive solutions in a declining market. The study, inter alia, includes concepts from agribusiness strategic management (i.e., industry driving forces, economic market structure, and competitive advantage), and supply chain management to examine the firm and industry.
Keywords: supply chain, agribusiness strategy, market structure, transaction costs

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IFAMA Agribusiness Case 18.4B

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[1] This is contribution no. 16-132-J from the Kansas Agricultural Experiment Station

The Challenge

Red Arrow produces and markets liquid smoke and browning solutions to the processed meat industry. In recent years profits increased, but the outlook for continued growth was uncertain. Though expenditures had been steady in recent years, the future demand for hot dogs is expected to decline (Ollinger et al. 2005). Sales of hot dogs and sausages reached $8.2 billion in 2012 and are forecasted to increase to $9.6 billion by 2019 (Convenience Store News 2013). On average, hot dog sales are expected to increase 2.5% annually, which is slightly ahead of the 1% forecasted population growth (U.S. Census 2014). Children are the primary market drivers for hot dog demand and the average number of children per family dropped from 1.3% in 1970 to 0.9% in 2013, resulting in overall smaller families (Mintel 2014). There are parental concerns about childhood obesity and issues related to product quality and freshness is not encouraging industry news. Furthermore, meat processors' profitability is strained by volatile raw material price changes, and a dramatic shift in American food choices from pork and beef to chicken. Suppliers to the processed meat industry, such as Red Arrow, received some good news. In 2003, The Food Safety Inspection Service (FSIS) an agency of the United States Department of Agriculture (USDA) published a final rule (68 FR 34207), which mandates that ready-to-eat (RTE) producers prevent product adulteration from the pathogenic environmental contaminant *Listeria monocytogenes.* The ruling effectively helped Red Arrow to promote liquid smoke for its antimicrobial efficacy along with application flexibility and quality enhancing properties such as flavor and appearance.

Red Arrow is faced with how it will compete for profits in a mature industry. Should it diversify its products or add complementary services? If so, on which of the firm's current resources should diversification be based? Should it continue to dedicate its resources that will deliver a cost advantage? Or is it time for Red Arrow's owners to consider selling its business?

Introduction

Since 1970, the per capita consumption of processed pork has been moderately unchanged. Beef demand of all types, fresh or processed had weakened relative to chicken. Some reports suggested the decline in the U.S. per capita consumption of processed meat contributes to the industry's structural changes (Table 1). Former U.S. Department of Agriculture (USDA) Secretary Dan Glickman stated "the meat supply is safer today than it's been in a long time, but that the potential for something going wrong is greater than ever" (Frontline 2002). Although the comment was not directed at any one firm, Mark Crass, Executive Vice President of Sales and Marketing for Red Arrow Products, understood that profits don't sit still. If the future growth in the demand for hot dogs were doubtful, then a subsequent decline in demand for his company's principal product was logical and rational. The structural changes in the meat processing industry and changes in consumer taste and preferences indicated that changes were inevitable. Mark has been with Red Arrow since 1985 and had experienced the ups and downs of economic cycles on liquid smoke. The market demand fundamentals seemed different this time. He anticipated changes in his firm's product mix, but selling a highly differentiated product into a cost-driven processed meat industry would lead to potential misalignment across the liquid smoke supply chain. Red Arrow is a privately owned company with corporate headquarters in Manitowac, Wisconsin. It has about 230 employees and is the largest producer and marketer of liquid smoke to the processed meat industry (Associated Press 2014).Its customers, industrial meat processors,

could choose to use traditional smoking methods, liquid smoke pioneered by Red Arrow, or a combination of these methods to smoke processed meats, such as sausages, hot dogs, hams, and luncheon meats (American Meat Institute 2005). Red Arrow is the world's largest producer and marketer of liquid smoke. Its products are water and oil soluble, produced as aqueous or free flowing powders, and they dissolve in concentrated brine. Still, Mark was concerned about the future growth of Red Arrow's flagship product—liquid smoke. His company understands the stiff competition for a place in the product formulation of one of America's favorite foods—hot dogs. Yet another larger issue, which extended beyond the hot dog segment, could affect his company's future profits.

Table 1. Per Capita Consumption of Processed Meat and Revenue

Year	Revenue ($m)	Per capita processed meat consumption
2006	177,131.70	276.6
2007	184,109.90	276.0
2008	192,310.50	268.6
2009	183,128.00	262.3
2010	194,670.20	259.9
2011	212,692.50	253.9
2012	212,675.80	251.3
2013	218,746.80	251.3
2014	236,660.70	250.0
2015	249,884.60	250.6
2016	256,861.50	251.9
2017	258,295.10	252.4
2018	258,759.70	254.9
2019	258,199.60	257.3
2020	257,788.50	258.7

The National Hot Dog and Sausage Council (NHDSC), however, was more optimistic about hot dog demand. The retail sales channel account for more than 60% of the market for hot dogs (Mintel 2012). NHDSC's press releases boasted that 837 million packages of hot dogs —totaling $1.8 billion—were sold in the U.S. in 2012. Companies similar to Hillshire Brands, Bar-S Foods, Oscar Mayer and Hebrew National have made hot dogs and luncheon meats a summer-time staple at ballparks and cookouts. Red Arrow is a supporter of NHDSC. However, there was some uneasiness about the future demand for hot dogs and the structural industry changes for its primary meat ingredients —beef and pork— could eventually hurt liquid smoke sales.

Industry observers believe that liquid smoke products are now used on 75% of the hot dogs produced in this country, and are distributed by most major ingredient suppliers. Mark carefully viewed the structural changes in the processed meat industry and the effect on hot dog sales. He pondered: Should Red Arrow focus its resources on lowering costs in order to withstand the downward path of hot dog demand? Or should they expand their boundaries beyond the hot dog segment of processed meat industry to create and capture value in a different market? In either case, Red Arrow had to adjust before company profits eroded.

Red Arrow History

Dr. Clifford Hollenbeck invented the process to manufacture liquid smoke, and would later found Red Arrow Products Company in Manitowoc, Wisconsin. Dr. Hollenbeck's 1963 invention allowed the capture, in water, of all of the components of smoke that are needed to provide smoke flavor, flavor stability, color and bacteriostatic characteristics to meat products without undesirable carcinogens and environmental pollution (Red Arrow Website). He originally patented a process of producing smoke flavors through pyrolyzing hardwood sawdust and capturing the wood smoke in a water solution. It uses a smoke condensate process using phase separation and condensing technologies (Exhibit 1). The sawdust is a byproduct of the lumber industry. The modern manufacturing process emulated the flavors of traditional smoking and with the guidance of food scientist, food processors were able to enhance foods or create authentic tastes. The almost transparent liquid smoke imparts a range of browning effects to meat and food products (Exhibit 2). The liquid smoke's flavoring component has been optimized to achieve browning, without an overpowering smoke taste and the smoke aids in improving the firm texture of hot dogs.

Over the years, Red Arrow constantly improved the purified primary smoke products. In 1998, the international division was established to meet the demand for smoked food outside of the United States. In 2014, Dale H. Hanke, the company's President and CEO, said, "exports have always been an important part of Red Arrow's strategy for growth and now represents more than one-third of the company's sales" (Matthews 2014). Red Arrow's products are distributed to more than 100 countries, are available worldwide through a network of technically trained, in-country distributors, and Red Arrow's international staff.

Red Arrow added a processing equipment subsidiary in 2010. It was established to provide its customers with advanced solutions to apply liquid smoke and browning agents. Customized application includes drenching, spraying and atomizing equipment, which are designed to produce efficient and consistent smoke and browning capabilities. The equipment subsidiary is a complement to the liquid smoke. Initially customers purchased liquid smoke without using Red Arrow's liquid smoke application equipment. To entice the equipment purchase, Red Arrow would lease the equipment at no cost to the hot dog manufacturer. The equipment provided supply chain costs savings related to transportation, storage, and order fulfillment benefits for both Red Arrow and the hot dog manufacturers. To finance the lease, Red Arrow would keep the supply chain savings until the lease was paid. For example, if the equipment cost $10,000 and the estimated supply chain savings equaled $.05/gallon, then the lessee would have to purchase 200,000 gallons of liquid smoke from Red Arrow. Once the 200,000 gallon purchase requirement was met, the price would be reduced by $.05/lb. The combination of equipment and

liquid smoke expertise provided its customers a single point of contact when developing plant operational efficiencies and new products. The liquid smoke system helps to control the concentration of smoke being applied, which is used to maintain the bacteriostatic and preservative qualities of the traditional smoking process. Red Arrow's business model includes: 1) a solid value proposition; 2) an enterprise organized to deliver a product below its cost to produce it; and 3) and a way to appropriate profits to its ownership.

Exhibit 1. The Production of Liquid Smoke

Exhibit 2. Images of hot dogs with and without liquid smoke.
Note. Hot dogs on the left treated are with liquid smoke and hot dogs on the right are not treated with liquid smoke.

Structural Changes Fresh Meat and Poultry

The meat and poultry industry is the largest segment of United States agriculture (American Meat Institute 2012). Total meat and poultry production in 2014 reached more than 93.1 billion pounds. Annual sales for 2015 are estimated at more than $249.8 billion among the meatpacking, meat processing and poultry processing industries (IBIS World 2015). Supporting the industry is a network of suppliers. Their value added activities enhance flavor, texture, color, and shapes processed meats. For instance, ingredient, casings, and packaging suppliers play a role in sustaining the product's profitability.

Scherer (1990) argued that a growth in demand leads to an increase in the number of operating firms, while a decline in demand leads to a contraction in the number of firms. Technological change, however, can either reduce or increase the number of firms. If a technological change reduces production or administrative costs, then plant size likely would grow, the number of firms would drop, and the concentration ratio would rise. However, if technological change reduces barriers to entry, such as high transportation costs, then the number of firms that a market can profitably sustain may rise and concentration ratios will drop. Thus, new entrants will have a lower threshold of output at which they can profitably produce. Slow growing market demand, and food safety concerns have forced older and inefficient plants out of the processed meat industry. Since 1972, the number of plants are moderately unchanged and the market concentration ratios have increased for processed meat companies (Tables 2 and 3).

Table 2. Number of processed meat plants

	1972	**1977**	**1982**	**1987**	**1992**	**2002**	**2007**	**2012**
Meat processing	1,311	1,345	1,311	1,343	1,260	1,335	1,381	1,346

Source. USDA, Statistical Handbook; Agricultural Statistics, various issues.

Table 3. Four-firm concentration ratios for meat processing industry

	1972	**1977**	**1987**	**1992**	**1997**	**2002**	**2007**	**2015**
Meat processing	16.0	18.0	19.0	20.0	23.0	24.2	27.9	35.7

Source. USDA Statistical Handbook and IBIS World 2015

The processed meat industry is comprised of firms that slaughter animals, process and market meat, but also firms that wholesales and retails exclusively. As a supplier to the processed meat industry, Red Arrow was keenly aware of positive and negative influences in the hot dog segment. For instance, nutrition and consumption, country of origin labeling (COOL), animal handling and welfare, and slow growth represented negative externalities for upstream supply chain partners. Studies have demonstrated that smoking is effective at reducing or suppressing *Listeria* and other food-related bacteria associated with ready-to-eat foods (Estrada et al. 1998). Using condensates for smoke application allows the meat processor to dictate the concentration of smoke being applied more readily than using gaseous smoke (Maga 1988, Sunen et al. 2001).

The NHDSC sponsored a contest to increase industry sales with promotional ideas and slogans. It selected the 2012-winning slogan Hot dog "Relish the Moments". In spite of their effort, the increased food safety regulations and consumer demand shapes the market. As such, utilizing liquid smoke in processing hot dogs offer Red Arrow's customers a means of complying with new rules addressing environmental contamination from *Listeria monocytogenes.*

Structural Change Processed Meat-Changes in Demand

The demand for hot dogs can be traced to the consumption of its principal ingredients —pork and beef— and eating habits. The 1994-96 and 1998 the Continuing Survey of Food Intakes by Individuals (CSFII) survey data indicate that 38% of the pork consumed was fresh and 62% processed (USDA 1996). The processed pork category was disaggregated into lunchmeats, hot dogs, bacon, sausage, smoked ham, and other processed pork. Processed pork dominates U.S. pork use. The average person consumed more smoked ham (14.4 pounds) than any other processed pork product. The second-most-consumed processed pork products were smoked sausage (6.5 pounds) and processed nonspecified pork (4.9 pounds). Hot dogs are the fourth-most-consumed processed pork product at 2.8 pounds per person (Davis 2005). In 1999, the number increased slightly to 2.9 pounds per person.

CSFII data indicated that 87% of beef consumed was fresh and 13% was processed. Fresh products are those muscle cuts of beef that are purchased from wholesale markets by food services or from grocery meat counters directly by consumers and are cooked just before eating. Processed beef products are transformed by curing, smoking, or seasoning prior to cooking; beef is a primary ingredient for hot dogs and smoked sausage, which can be further differentiated by its product quality attributes (Raikes et al. 2000). These quality attributes encompass the manner in which products are produced, for example, organic production and animal welfare concerns.

Hot dogs are made from all types of meat trimmings (pork, beef, chicken, and turkey), including mechanically separated meat. Chicken hot dogs, turkey hot dogs and all possible combinations can be found in a supermarket; however, consumers largely prefer beef and pork hot dogs (Mintel Group 2012). The processed meat eating habits of Americans has changed. The per capita consumption between 2006 and 2015 declined and the future consumption of processed meats are expected to increase marginally between 2015 and 2019 (Table 1). The U.S- hot dog market is driven primarily by demographic factors, including households with children, which factor heavily into sales. The decline in families with children and the general increase in healthier eating have had a negative impact on the hot dog segment (Mintel 2014).

Structural Changes - Food Standards and Competition

Foodborne illnesses caused by *Listeria Monocytogenes* and *Escherichia-coli 0157:H7* can severely damage the meat industry. The deadly pathogens are found in RTE processed meat and poultry and ground beef. *Listeria* is an environmental microorganism that thrives in cold temperatures and can be found in the water droplets on ceilings and floor drains. It is killed during pasteurization and heating, so prepared meats that are contaminated during processing and are not re-cooked are most susceptible (hot dogs and deli meats, for example). *E-coli* can be linked to beef, as cattle are one of the primary hosts. Cross-contamination and transmission can occur when cattle are harvested and a hide with cattle feces comes in contact with a carcass, and meats are undercooked (National Cattlemen's Beef Association 2011). There are higher costs to control pathogens and maintain a company's reputation for food safety and quality. The processed meat sector employs several layers of safety interventions and works cooperatively with government inspectors to prevent this from occurring.

This threat of lost sales led to market-driven efforts to provide safe food. Major buyers of food products, such as supermarkets, fast foodservice chains and major food processors use their own private standards for strategic reasons including to reduce their supply chain costs, to use as barriers of entry, or self-regulation before governments or international organizations do. The main cost reduction comes from using process standards to coordinate procurement chains and systems. Farina et al. (2005) and Gutman (2002) for example, illustrate these cost savings in the case of supermarkets and dairy products in Brazil and Argentina. Suppliers complement private standards with other elements of "quality management metasystems", such as branding and system governance structures (Caswell et al. 1998). Building trust and reputation around the visible symbol of a brand name and label make standards systems credible to consumers (Henson and Reardon 2005). To build consumer confidence through consistency in standards implementation and thus build market volume and reduce market risk, tight vertical co-ordination is needed, especially in the case of process standards.

The structural changes lead to other impacts as well. For example, a leveling or declining per capita consumption of meat led to a contraction, acquisitions, or divestitures of meat processing operating firms. Increased productivity reduces production costs, leading to lower commodity and retail prices. Since 1982, there have been constant changes in the top 10 producers of meat and poultry (Table 4). For instance from 2001 to 2013, there has been a 40% change in the makeup of the top 10 processing firms. Trends toward free-range, grass-fed, and organic products will likely lead to ongoing changes in the leading players in the processed meat and poultry industries. In addition to broad trends related to consumer preference, disease outbreaks have limited industry growth during specific years. In 2013, for example, Porcine Epidemic

Diarrhea (PED) virus began decimating pig litters, depleting the supply of hogs. Reduced herd numbers have pushed prices up, slightly inhibiting consumption of pork products.

Table 4. Top 10 meat and poultry companies by net sales

Rank	1982	1991	2001	2013
1	Iowa Beef Processors Inc.	ConAgra, Inc.	Tyson Food	Tyson Foods, Inc.
2	Amour & Co.	IBP, Inc.	ConAgra Inc.	JBS
3	Swift & Co.	Excel/Cargill	Excel/Cargill	Cargill Meat Solutions
4	Wilson Foods	Tyson Foods, Inc.	Smithfield Foods Inc.	Smithfield Foods Inc.
5	John Morrell & Co.	Sara Lee Packaged Meats	Farmland	Sysco
6	Swift Indep. Packing Co.	Geo. A Hormel & Co.	Sara Lee Packaged Meats	Hormel Foods Inc.
7	Oscar Mayer & Co.	Oscar May Foods Corps.	Hormel Foods Inc.	ConAgra Foods Inc.
8	MBPXL Corp.	John Morrell & Co.	Oscar Meyer	National Beef
9	Geo. A Hormel & Co	Beef America Operating Co.	Perdue Farms	Keystone Foods
10	Land O'Lakes	International Multifoods	Pilgrim's Pride	OSI Food Group

Source. Compiled from various sources

The Decision to Compete: How and Where

Red Arrow's liquid smoke offers RTE meat processors a valuable option for complying with the USDA/FSIS final rule of employing a "post- pasteurization process" and increases production output. Processed meat spends less time inside the industrial smokers as compared to natural smoking methods (Exhibits 3-5, see Appendix). The price per unit of liquid smoke is higher than natural smoke. However, when industrial buyers consider the marginal social costs, along with opportunities for cost containment, process efficiency and quality improvement, its overall cost of use is lower. Industrial buyers recognize Red Arrow for its ability to continuously improve. In order to take advantage of its strength and reputation, Red Arrow considered changing from 'how to compete' to 'where to compete'. The management team at Red Arrow was aware of the production and distribution synergies between flavors and liquid smoke. Expanding the firm capabilities would require recognizing the structural changes happening across the industry and reallocating the firm's resources would require a sales approach different than the liquid smoke product line. Meeting the standards of service and expertise is a part of its value proposition. Its sales force would need to be transformed from a highly technical sales group with expert knowledge in meat science and equipment design and application to a sales force with terrific knowledge about complex flavors often used to enhance or mask unpleasant qualities. It now must answer the question "how to compete" with flavors.

Market Structure and Differentiation Strategies

There are two companies selling liquid smoke to the industrial meat and poultry processing industries and other smaller companies selling liquid smoke in small containers through the retail sales channel. The two-firm market concentration ratio (CR2) is estimated to be .80. CR2

indicates two organizations supply 80% of the market; as such Red Arrow enjoys monopoly profits. Red Arrow's customers in the processed meats industry have a CR4 ratio of .279. The concentration ratios suggest a somewhat fragmented group of buyers of liquid smoke.

The flavors and extracts industry has CR4 of .296 and the CR8 was .42 in 2007 (United States Census Bureau 2013). The top buyers for flavors represented a CR4 of .25. Thus, the market is less concentrated for the purchase and production for flavors compared to the market structure for liquid smoke. Considering the structural challenges ahead of the processed meats industry, Red Arrow sought out to diversify its company and enter a market segment that is more competitive (more buyers and sellers) and larger.

Organizational Constraints and Adaptable Solutions

Red Arrow considered expanding the boundaries of its firm of "where to compete" by investing its resources into savory flavors. The market for savory flavors is more competitive than liquid smoke. A decision to expand its operations into savory flavors would require either acquiring a flavoring company, entering into a strategic alliance to sell flavors or develop its own product line of flavors. Red Arrow had to determine if it could use its current resources to enter into the flavorings market. If successful, it would create a favorable market position where its own resources made it more difficult for others to catch up. To achieve this, Red Arrow would need to use its resources of meat science knowledge, liquid smoke production expertise, and equipment design for liquid smoke and savory flavors. Mark and his sales staff needed to assess their capability to sell flavors. Mark expected savory flavors sales would require sales skills beyond the composition, nutritional value, wholesomeness, and consumer acceptability expectations for processed meat. A comparison of the organizational elements of transformation —people, process, technology—for selling the cost driven product (liquid smoke) to selling a differentiated product (savory flavors), provided a framework to assess Red Arrow's organizational readiness.

Red Arrow's liquid smoke sales tactic targets industrial buyers that value strong technical sales representation from its suppliers. The customer's key decision makers, purchasing and manufacturing personnel, often want competitive prices and efficient operations. Flavors warrant a sales approach different than the liquid smoke product line.

Unlike liquid smoke, personnel from R&D, Sales and Marketing Departments are the key decision makers when purchasing flavors. This group's objective is tied closely to increasing revenue, new products, changes to existing products, and higher levels of customer service.

Liquid Smoke Sales versus Savory Flavoring Sales

Red Arrow found there were a number of differences in selling liquid smoke and flavors. At the same time, there were synergies. Red Arrow's sales team believed that only 10% of its customers viewed Red Arrow as commodity supplier. The other 90% viewed its products as highly specialized. This was important because savory flavors are value added and highly differentiated products and a 'people challenged' organization is akin to a sales staff with outdated skills. It was apparent to Mark the same sales staff that helped the liquid smoke business is capable of doing the same with a highly differentiated product like flavors.

Table 5. Elements of Organizational Transformation — Liquid Smoke and Savory Flavors

	A Comparison Liquid Smoke and Savory Flavors		
	Transformation Elements	**Cost Oriented Liquid Smoke**	**Differentiation Oriented Savory Flavors**
Red Arrow's Approach	People	A technically driven sales staff focused on operational improvements through the value chain.	Technical sales needed; however, meat science is not the key value proposition. Sales personnel involved in other sales skill sets i.e. maneuvering and collaborating skills.
	Process	Highly standardized products. Liquid smoke is produced in anticipation of a customer order (push) i.e. smoke is held in inventory in anticipation of a customer order.	Highly differentiated products. Flavors are requested as needed (pull), i.e. flavors are not held in inventory and produced for actual customer orders.
	Technology	Fast burning technology to capture the attributes of the desired smoke components.	Uses tools to identify and then measure the taste profile.
	Bottom Line	Sales staff has expertise on reducing costs for its customers.	Increases sales and profits.
Customer Impact	People	Initial contact is with R&D, but ongoing involvement is with plant operations personnel mainly smoke room employees, production supervisors, and occasionally quality assurance.	A different set of stakeholders than liquid smoke: R&D, Marketing, and to a lesser degree Purchasing Departments. Each group has a different objective to meet the company's overall goal.
	Process	Telemetry systems for automated replenishment of supply—TankLink. Application systems involving atomization, drenching, brine injection for water soluble, aqueous, oil, and dry smokes.	Involves more testing to reach organoleptic objectives. Taste panels, focus groups, foodservice chefs, and etc.
	Technology	The uses of bulk tanks drench cabinets and add back systems to apply liquid smoke. The development of more than 100 different types of smoke to produce flavor characteristics associated with flavor, color and aroma.	Try to make a very subjective area very objective to market a particular flavor.
	Bottom Line	There are more costs savings than revenue gains.	New products generate sales. Cost savings is not the impetus for change.

Note. Red Arrow's liquid smoke sales tactic targets industrial buyers that value strong technical sales representation from its suppliers. The customer's key decision makers, purchasing and manufacturing personnel, often want competitive prices and efficient operations. Flavors warrant a sales approach different than the liquid smoke product line.

A rigid and process-laden approach to product delivery constitutes a 'process challenge' that often leads to delays in product delivery. Red Arrow's customers were seen as competing more and more in markets that called on its supply chain to be responsive to changes in demand. Its focus on efficiency was important, but now there is increasing evidence that responsiveness is important to its customers. However, continuous improvement requires newer technologies or processes to produce the essence of a flavor.

Red Arrow did not face a 'technology challenge'. Although the manufacturing requirements for liquid smoke and flavors are vastly different, the research and development are similar. Its customers often made its own product attribute decisions, like taste, color, odor, and mouth feel. In the early stages of product development they typically did not involve suppliers like Red Arrow. Unlike liquid smoke, however, flavors present an entirely different supply chain problem.

Mark was proud of Red Arrow's accomplishments. Its innovations on product development and process improvements create a solid business model. If Red Arrow builds a similar business model for flavors, it could experience another profitable revenue stream. In order to accomplish this, it must take a page from its liquid smoke playbook and develop techniques to increase supplier switching costs, gain access to new information, and position its flavors as specialized product in a fragmented market. If successful, it could gain market power and influence as it had accomplished with liquid smoke.

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Appendix

Exhibit 3. An Industrial-Sized Smoke House

Exhibit 4. Hot dogs in an Industrial-Sized Smoke House being sprayed with liquid smoke

Exhibit 5. Hot dogs leaving the Industrial-Sized Smoke House

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