The use of market intelligence and producer decision-making as a driver of industry competitiveness:

A producer perspective on the Canadian and Irish beef industries

by

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Abstract

The Canadian and Irish beef industries are facing numerous challenges ranging from domestic consumer concerns, margin pressures, uncertainties around new trade agreements and developments in key export markets. These issues present competitive threats but also offer potential new opportunities to the overall industries and individual beef producers.

This thesis focuses on the use of market intelligence, i.e. the knowledge of external market factors that can affect current and future consumer demands and preferences, and how it plays a role in enabling both the overall industries and individual producers to turn challenges into competitive advantages, thereby responding to the previously mentioned external market factors. In this context, a deeper understanding is valuable of how market intelligence influences producer and industry's collective decision-making, as both are critical to strengthening the overall industry's competitive position.

To that end, a conceptual model based on the market orientation literature has been designed and turned into a measurement tool for the industry's competitiveness level. Data that served as input to this measurement indicator was generated using online surveys distributed among beef producers in Western Canada and Ireland and focused on their perception of external market factors, the use of market intelligence within their industry and their own decision-making processes. A more exploratory analysis was performed due to limited sample sizes.

General results indicate that, according to producers, external market factors like consumer demand for specific attributes and production systems as well as trade agreements and EU regulations play an important role in the industries' competitive position. Both industries can be characterized as supply-driven, while the Canadian beef industry has a commodity nature and the Irish beef industry is affected by policy forces. Likewise, although both industries make use of market intelligence to a certain extent and have strategies in place to deal with above-mentioned challenges, both beef industries could more actively respond to ongoing market developments.

However, both industries are subject to a relatively high average of producers, resulting in limited opportunities to fulfill export and domestic consumer demand and adoption of new production practices and technologies. Recommendations for the Canadian beef industry therefore include increasing alignment among its production segments and improving programs for young beef producers to enter the industry. Recommendations for the Irish beef industry include to improve alignment between the production segments and the processors to solve an existing disconnect within the industry, and to increase productivity by consolidating its suckler cow segment to ensure a sustainable profitability level.

Preface

This thesis is an original work by Jolien Witte. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, project name "The use of market intelligence and decision-making as a driver of industry competitiveness: A producer's perspective on the Western Canadian and Irish beef industries", no. Pro00071243, on March 22, 2017. No part of this thesis has been previously published.

Acknowledgements

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Glossary of abbreviations

AAFC   Agriculture and Agri-Food Canada

ABP   Alberta Beef Producers

ACFA   Alberta Cattle Feeders' Association

BCACF   British Columbia Association of Cattle Feeders

BCCA   British Columbia Cattlemen's Association

BCRC   Beef Cattle Research Council

BDGP   Beef Data & Genomics Programme

BQAS   Beef Quality Assurance Scheme

BTAP   Beef Technology Adoption Programme

BVCRT   Beef Value Chain Round Table

CB-SEM   Covariance-Based Structural Equation Modeling

CBA   Canadian Beef Advantage

CBBC   Canadian Beef Breeds Council

CBGA   Canadian Beef Grading Agency

CCA   Canadian Cattlemen's Association

CFA   Confirmatory Factor Analysis

CETA   Comprehensive Economic Trade Agreement (Canada – EU)

CPTPP   Comprehensive and Progressive Trans-Pacific Partnership

CRSB   Canadian Roundtable for Sustainable Beef

DAFM   Department of Agriculture, Food and the Marine

EFA   Exploratory Factor Analysis

EU   European Union

FAA   Feeders Association of Alberta

ICBF   Irish Cattle Breeding Federation

ICSA   Irish Cattle & Sheep Farmers Association

ID   Intelligence Dissemination

IFA   Irish Farmers Association

IG   Intelligence Generation

IR   Intelligence Responsiveness

MBP   Manitoba Beef Producers

MII   Meat Industry Ireland

MO   Market Orientation

NAFTA   North American Free Trade Agreement

NAICS	North American Industry Classification System
NCFA	National Cattle Feeders' Association
NFS	National Farm Survey
PLS-SEM	Partial Least Squares Structural Equation Modeling
SCA	Saskatchewan Cattlemen's Association
SCFA	Saskatchewan Cattle Feeders' Association
SEM	Structural Equation Modeling
SSGA	Saskatchewan Stock Growers' Association
UAA	Utilised Agricultural Area
VBP+	Verified Beef Production Plus
WCCCS	Western Canadian Cow-Calf Survey
WLPIP	Western Livestock Price Insurance Program

Chapter 1: Introduction

1.1   Background

Actors in agricultural markets face many different types of uncertainties, ranging from the development of technological factors to increase productivity and efficiency (e.g., precision agriculture, genetic engineering leading to new crop varieties and breeding tools); environmental factors such as the consequences of climate change that increases the variability in agricultural production and increasing pests and diseases in animals and crops; and political economic factors like discussions regarding multilateral trade agreements, government policies, and instability in global financial markets. Other factors that cause uncertainty in agricultural markets include changing food consumption patterns in both developed and developing countries. Consumers in developed countries in particular have become increasingly concerned about for example animal welfare and food safety and are demanding more information regarding production practices of their food products. In order to produce food in an economically, environmentally and socially sustainable way, farmers and agricultural industries have to react to the above-mentioned challenges and concerns affecting their business and market environment.

One example of an agricultural industry that is dealing with its own concerns and challenges is the beef industry[1]. Consumption of beef products has been declining in developed countries due to decreased consumer confidence in beef products, increased uncertainty regarding quality expectations and healthiness of beef products in consumers' diets (e.g., effects on cancer and high cholesterol levels (van Wezemael et al., 2010, OECD-FAO, 2016)), competition in both price and convenience from other meat proteins such as chicken, and the contribution of beef production to climate change by producing greenhouse gases like methane (Polkinghorne et al., 2008; van Wezemael et al., 2010; Henchion et al., 2014; Field, 2017). One particular concern is the ability to deliver high-quality beef products that meet the expectations of both processors and end consumers and that do not harm consumers' eating experiences in terms of tenderness, consistency and palatability.

On the production side, beef industries in developed countries are facing additional challenges such as animal diseases and foreign trade policies (OECD-FAO, 2016). High levels of price

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[1] "The beef industry includes breeding, feeding and marketing cattle with the eventual processing and merchandising of retail products to consumers" (Field, 2017, p. 1).

volatility have been impacting beef producers'[2] profitability levels globally as illustrated in Figure 1.1 (agri benchmark, 2016). In 2015, prices fell significantly following weakened demand and robust supply growth (OECD-FAO, 2016), affecting all beef production segments. However, price volatility has been limited in European countries as a result of European prices being sustained by import barriers and government payments, the latter being the highest for the grazing livestock sector (Vrolijk et al., 2010). Global beef prices are expected to continue to highly vary due to influences from other global commodity markets, macroeconomic and policy factors, as well as climate volatility, uncertainties around trade agreements currently being discussed (e.g., renegotiation of NAFTA, implications of Brexit), and the availability of natural resources and technological opportunities (OECD-FAO, 2016; MLA, 2017). In addition, many beef producers have been focusing on increasing efficiency and lowering their production costs as a means to improve their performance (Micheels, 2010). Beef industries also have difficulties to change production practices to respond to consumer demands, as beef industries have a rather high degree of independence among its value chain segments and a relatively high average age of producers (Belk et al., 2014; Twine et al., 2016; Field, 2017). As such, a particular challenge is the competitiveness and long-term economic viability of beef farms that increasingly have to rely on revenue streams from other enterprises or an off-farm income. This in turn creates difficulties in maintaining a competitive position and market share for the beef sector as a whole (Henchion et al., 2014).
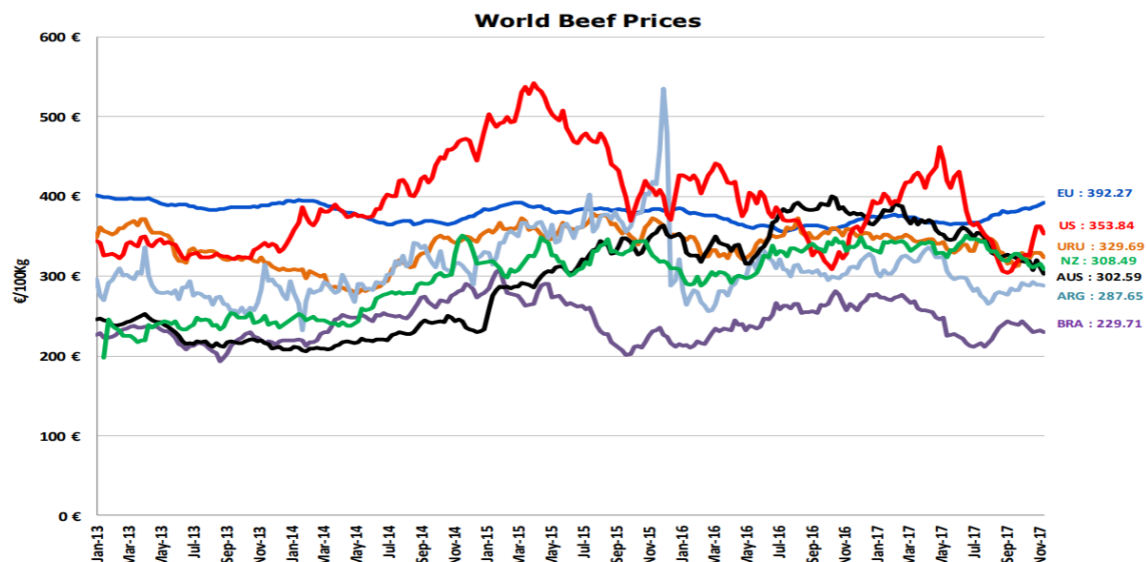
Figure 1.1: World beef carcass prices 2013-2017 (EC, 2017)

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[2] A beef producer is defined as any farmer who is involved in raising cattle, from breeding to fattening to finishing

However, the outlook for beef industries in developed countries is not totally somber. It is expected that beef consumption will grow in developing countries due to higher income levels, resulting in increased export opportunities. Closer to home, preferences of different consumer groups have been evolving leading to increased demands based on credence attributes from production practices. Examples of these attributes include organic, natural, hormone-free, grass-fed, the use of certain breeds, and environmental sustainability (Loureiro and Umberger, 2007; Grunert et al., 2011; Henchion et al., 2014; Field, 2017), and result in market opportunities for the beef industry. As indicated above, quality attributes such as tenderness and consistency that are important determinants of consumer satisfaction could also be improved. Therefore, advancing and maintaining the delivery of high-quality beef products requires augmenting the understanding of how consumers perceive and value quality (Henchion et al., 2014). In other words, this means investigating the current and future demands and preferences concerning beef products, examining the external factors of influence on these demands, and reacting to this information. This in turn necessitates making important strategic decisions, such as choosing particular breeds, production technologies and making use of genetics as the above arguments showed that the beef industry cannot compete on price alone.

1.2 Economic problem

In traditional economics, producers are assumed to be rational agents who aim to maximize profits or minimize production costs. For commodity producers, it is assumed that they face equal costs and market demands, and have perfect information concerning prices, product characteristics and trading partners. However, according to the institutional economics literature, there is no such thing as a frictionless economic environment since the process of exchanging goods involves costs of, for example, discovering prices and negotiating contracts. This means that both producers and consumers have imperfect information, and for producers this results in information being a supply-increasing input to their production process. This also implies that information adds to producers' welfare, assuming that they would only use it as an input if it improves their production decisions and thus their bottom line (Babcock, 1990). As such, the ability to access and process information and produce knowledge from it is a critical determinant of economic performance (Just et al., 2002), resulting in that a numeric value can be put on information as an input. Uncertainties in the business environment of economic agents constrains their optimization problems and results in having imperfect information. This means that economic agents must position themselves strategically in order to sell their goods and products by making use of relevant information and acting on the knowledge produced from it.

The above principles can also be applied to an agricultural industry as the unit of analysis. Agricultural industries consist of a large quantity of agricultural producers, and so individual producers' decision-making processes can be summed to the decision-making process of the industry. Therefore, the aggregate value of information to an agricultural industry is the sum of the value of information to individual producers (Babcock, 1990). When an agricultural industry is dealing with uncertainties in their business environment, it also has to position itself strategically, which strengthens the need for information on their market environment and the factors that are of influence on this environment.

However, relatively little is known about how agricultural industries access and process information and produce knowledge from it in order to react to uncertainties in its business environment. This is mainly due to the presence of many stakeholders and broad scope when using the industry as the unit of analysis. Nevertheless, without taking into account a holistic view of an agricultural industry's environment, it is difficult for policy makers and decision-makers within these industries to provide strategic direction given the uncertain circumstances. This thesis seeks to address this economic problem by studying which factors are of influence on the value of information to agricultural industries, how it is processed and used in strategic decisions, and how this can be measured at the industry level in agriculture. In doing that, we will make use of a framework from the marketing literature known as market orientation. The concept of market orientation centers around a continuous understanding of the market by collecting, processing and reacting to market intelligence, in which the latter is a synonym for information on broader external market factors that could influence current and future consumer demands (Kohli and Jaworski, 1990). This concept has been extensively studied, applied to and measured for individual firms and value chains in different sectors, but it is relatively unknown how it is implemented in agriculture or at the industry level.

1.3   Research objectives and questions

The purpose of this thesis is threefold. The first goal of this thesis is to adapt the concept of market orientation to the agricultural industry level. It thereby takes the beef industries in Canada and Ireland as examples and extends a framework previously developed and applied to the firm or value chain level to the industry level. A second goal of this thesis is to study the beef industries in Canada and Ireland in detail. This supports the investigation of determinants of the level of market orientation for these two industries specifically when coping with uncertainties (such as described in Section 1.1). Based on the developed framework and the application to these two beef

industries, hypotheses are formulated to be tested in the empirical part of this thesis. The third and ultimate goal of this thesis is to quantify the level of market orientation of the two beef industries that facilitate a benchmark and comparison in terms of competitiveness between the Canadian and Irish beef industries. The results of this thesis will guide policy makers' decisions concerning the future strategic direction of these beef industries.

As such, this thesis aims to answer the following research questions:

1. How are the beef industries in Canada and Ireland organized and what is currently done to increase the level of market orientation?
2. How can the concept of market orientation in an agricultural setting at industry level be modeled and quantified?
3. What are determinants of market orientation and producer decision-making processes in the Canadian and Irish beef industries?
4. What are similarities and differences between the Canadian and Irish beef industries when making use of market intelligence?
5. Which improvements can be made in the Canadian and Irish beef industries to increase the level of market orientation?

1.4   Structure of thesis

This thesis is organized into eight chapters. Following this introductory chapter, Chapter 2 provides an overview of both the Canadian and Irish beef industries, for which key production statistics and an overview of the respective value chains are presented. This chapter also discusses the broader policy and trade environments of the Canadian and Irish beef industry as well as current challenges and opportunities.

Chapter 3 gives an overview of the economic, (strategic) management and marketing literature that surround the concepts of market orientation, the use of market intelligence and producer decision-making. More specifically, this chapter provides an overview of the evolution of the market orientation concept, its associated wide scope of applications, and different modeling approaches. This chapter also discusses which of these factors influence the level of market orientation and use of market intelligence in the context of agriculture, applied to both the firm level and value chain level.

Chapter 4 starts off with discussing in more detail the modeling approaches applied to the value chain level in agriculture. This chapter then presents a modified conceptual model of the determinants and level of market orientation of the industry level in agriculture, and finishes with

an empirical model to be tested in this thesis. More specifically, this empirical model highlights the expected relationships between the determinants of the level of market orientation of agricultural industries, from which hypotheses are derived.

Chapter 5 discusses the methodological considerations associated with testing this empirical model. More specifically, it provides an overview of how the choice for an online survey tool as data collection model was influenced by the selection of research philosophy, research approach, and research strategy. This chapter also discusses different measures of market orientation and how these can be adapted to measure the level of market orientation of Canadian and Irish beef industries, as well as the design and implementation of the online survey tool and the empirical strategy of how to test hypotheses.

Chapter 6 gives an overview of the collected data for both Canada and Ireland. As a result of limited sample sizes in both Canada and Ireland following the distribution of the online survey tool, this chapter also discusses an alternative empirical strategy to analyze the collected data and be able to provide insights into the use of market intelligence for agricultural industries.

Chapter 7 provides the results of a descriptive-comparative analysis concerning the use of market intelligence in the Canadian and Irish beef industries and discusses differences and similarities in responding to external market factors by these two beef industries.

Finally, Chapter 8 ends this thesis by drawing conclusions and providing recommendations to the beef industries in Canada and Ireland, as well as presenting potential policy implications. This chapter also reflects on the process of conducting this research.

Chapter 2: Overview of the beef industries in Canada and Ireland

Before providing an overview of the academic literature surrounding the issues discussed in Chapter 1, this chapter presents the current organization and structure of both the Canadian and Irish beef industries. First an overview of the beef value chain is provided, followed by an outline of which practices are currently being performed at the industry level to the level of market orientation. The challenges and opportunities faced by the two countries in going forward are also listed. This chapter thereby aims to provide an answer to the first research question, "How are beef industries in Canada and Ireland organized and what is currently done to increase the level of market orientation?" in order to consider the specific environment in which market orientation practices at the industry level are explored. This chapter ends with a comparison between the two countries in Section 2.3 and highlights the need of being market oriented for these two beef industries.

2.1   Canada's beef industry

The Canadian beef and cattle sector is an important part of the Canadian economy, by contributing an average of $16 billion to Canada's Gross Domestic Product (GDP), equivalent to about 1%, over the period 2012-2016 (Canada Beef, 2017). The overall Canadian beef industry, including processing and trading segments, contributes about $41 million to Canada's economy and provides for 228,000 jobs (CRSB, 2016). Table 2.1 presents some additional statistics for selected years. From that table it can be seen that about 3.1 million head of cattle were finished to market weight in 2016 (Statistics Canada, 2017h), of which 74% was finished in Western Canada, resulting in a total output of approximately 1.3 million metric tons[3] of beef products (Canada Beef, 2017). 46% of the annual output was exported in 2016, at a worth of $2.27 billion (Canada Beef, 2017). Cattle and calves cash receipts totaled $8.6 billion in 2016, which is almost 15% of total farm cash receipts (Statistics Canada, 2017d) and a decline of 18% compared to 2015. The number of farms reporting to have beef cattle on their operation equaled 62,253 in 2016, while this same number was 103,673 in 1996 and 83,000 in 2006 (Statistics Canada, 2017i; 2017k). More specifically, the number of operations with beef breeding cattle decreased with 11.9% between 2011 and 2016, and the number of operations with feeder or slaughter cattle declined by 16.9% over the same time period (Statistics Canada, 2017m).

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[3] 1 metric ton = 2,204.6 lbs.

Table 2.1: Overview of economic indicators of the Canadian beef industry

Economic indicator	2010	2011	2012	2013	2014	2015	2016
Number of beef cattle (x 1,000)[a]	10,730.4	10,202.0	10,263.3	10,285.7	10,129.1	9,744.9	9,714.7
Number of animals finished (x 1,000)[b]	3,735.7	3,393.9	3,110.3	3,066.1	3,165.5	2,912.0	3,091.7
Cattle and calves cash receipts, annual in '000 dollars[c]	6,149,186	6,265,966	6,508,637	6,799,848	9,820,259	10,497,539	8,638,739
Number of operations[d]	76,735	72,735	71,109	69,420	68,576	67,831	62,253

[a] Source: Statistics Canada (2017h)
[b] Source: Statistics Canada (2017g)
[c] Source: Statistics Canada (2017d)
[d] Source: AAFC (2017a)

With currently approximately 9.5 million heads of cattle in Canada and over 62,000 beef cattle operations (Statistics Canada, 2017a) that are mostly family-owned and -operated (CRSB, 2016), beef cattle operations can be found in all provinces. However, beef production in Canada is concentrated in the Western provinces with Alberta in particular, due to local feed and land availability (Beauchemin et al., 2010). The number of feeder cattle and size of beef breeding stock accounted for 59.6% and 42.3%, respectively, of the total Canadian herd in 2016, and the four Western provinces (British Columbia, Alberta, Saskatchewan and Manitoba) together accounted for over 70% of the national herd (Statistics Canada, 2017c). Therefore, we will focus on these four Western provinces in the remainder of this thesis.

2.1.1 Beef value chain

Figure 2.1 shows the relevant aspects of the Canadian beef value chain and product flow, separated into the production and market segments[4]. It also shows which organizations support the different segments, and the current policy and trade environment.

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[4] See the glossary of abbreviations at the beginning of this thesis for the meaning of used abbreviations

Value chain & Product flow	Production segments				Marketing segments	
	Seedstock	Cow-calf	Backgrounding/ Stocker	Feedlot	Processors/ Packaging	Retail/ Sales
Size		BC: 94 AB: 161 SK: 157 MB: 154	BC: 199 AB: 418 SK: 260 MB: 158	BC: 76 AB: 1146 SK: 667 MB: 1016	2.5 million head 1.2 mln tons beef product	
Decision-making	Input/buying (breeds, type/source of feed) Output/marketing (retain ownership, direct marketing, target market) Short-term/operational (weaning, feeding, harvesting) Long-term/strategic (production system)					
Industry organisa-tions & initiatives	National/provincial cattle organisations (Hereford, Angus) & CBBC CCA & provincial producer organisations (BCCA, ABP, SCA, SSGA, MBP) NCFA & provincial feeders' organisations (BCACF, ACFA, FAA, SCFA) BCRC, Check-Off, VBP+ Beef Cattle Industry Science Clusters, Beef Research & Technology Transfer Strategy				Canadian Meat Council	Canada Beef Inc. → CBA
	BVCRT & CRSB					
Policy & trade	National Beef Strategy & Growing Forward 2 US, CETA, NAFTA					

Source: AAFC (2017a), CRSB (2016), Statistics Canada (2017m)

Figure 2.1: Canadian beef value chain

The main beef production segments of the Canadian beef industry are seedstock or breeding, cow-calf, backgrounding or stockers, and a feedlot or finishing segment. Beef production in Canada is predominantly grass-fed and grain-finished, based on Bos taurus breeds such as Hereford, Angus, Charolais and Simmental (Beauchemin et al., 2010). At the start of the beef value chain are breeding or seedstock operations that function as specialized cow-calf operations by producing genetic resources such as breeding animals, semen and embryos that are used in subsequent stages of beef production (Field, 2017). The breeding segment is crucial to the competitiveness of the Canadian beef industry as the collective genetic decisions made by breeding producers need to match the management systems and goals of commercial cow-calf producers (e.g. reproductive efficiency and the variability and availability of resources), as well as market and consumer specifications further down the value chain.

On commercial cow-calf operations, cows are selected to produce calves based on desirable traits and using the genetic resources from the breeding segment in order to match the preferences of end consumers as well as the economic and natural environment of the beef operation. Heterogeneity exists in cow-calf operations in Western Canada in terms of whether calves are retained until a later stage or directly sold after weaning, whether the operation produces for a value-added market such as the organic market, and whether the cow-calf enterprise is mixed with a crop enterprise to provide feed or a secondary income. The cow-calf segment of the Canadian beef industry is therefore diverse in terms of herd size and production systems, as well as available resources, management practices, market targets, structure of the overall farm and location of the farm (Field, 2017). Table 2.2 gives an overview of this heterogeneity in cow-calf operations in Western Canada, which shows a relatively high degree of segmentation (i.e., cow-calf only operations) while operations covering the cow-calf through finishing stages are mainly prevalent in Alberta. In addition, Table 2.3 shows an overview of the number of farms involving both livestock and crop production, from which it can be seen that livestock as a secondary income compared to crops is more prevalent in Alberta and Saskatchewan than the other two provinces.

Table 2.2: Number and percentage of cow-calf operations per type in Western Canada on January 1, 2017

Type of cow-calf operation	British Columbia		Alberta		Saskatchewan		Manitoba	
Mixed dairy and beef operations	94	2.1%	165	0.9%	119	0.9%	112	1.8%
Cow-calf only operations	3,950	87.6%	16,740	86.7%	12,676	93.0%	5,425	85.6%
Cow-calf through backgrounding operations	410	9.1%	1,198	6.2%	811	6.0%	386	6.1%
Cow-calf through feedlot operations	53	1.2%	1,203	6.2%	19	0.1%	415	6.5%
Total	4,507	100%	19,306	100%	13,625	100%	6,338	100%

Source: AAFC (2017a)

Table 2.3: Number of other types of livestock operations in Western Canada in 2016 according to the North American Industry Classification System (NAICS)

Type of operation	British Columbia	Alberta	Saskatchewan	Manitoba
Livestock farming with secondary crop farming[a]	942	1,201	545	312
Crop farming with secondary livestock farming[b]	383	1,281	764	306

[a] NAICS 112991: Includes all types of livestock farming, combinations of livestock farming, livestock farming with secondary crop farming (Statistics Canada, 2017j)
[b] NAICS 111999: Includes miscellaneous crops, combination of crops, crop farming with secondary livestock farming (all types) (Statistics Canada, 2017j)

Table 2.4 gives an overview of the composition of types of beef cattle on cow-calf operations in the Western provinces, again demonstrating the importance of beef production on cow-calf operations in Alberta. The average herd size per province is shown in the overview of the value chain, Figure 2.1. However, the number of cow-calf operations in all of Canada decreased with 9.5% from 2011 to 2016, while the average herd size increased by 12.5% over this time period (Statistics Canada, 2017m). As can be seen from Figure 2.2, profitability levels for cow-calf operations have been good over the last few years until the cattle price reached a high in April 2015. Like the breeding segment, the cow-calf segment is crucial to the competitiveness of the Canadian beef industry as collective decisions regarding, for example, the size of the herd, expansion, breeds, target market and production system affect subsequent stages of beef production, as well as the ability of the overall Canadian beef industry to fulfill export and consumer demands.
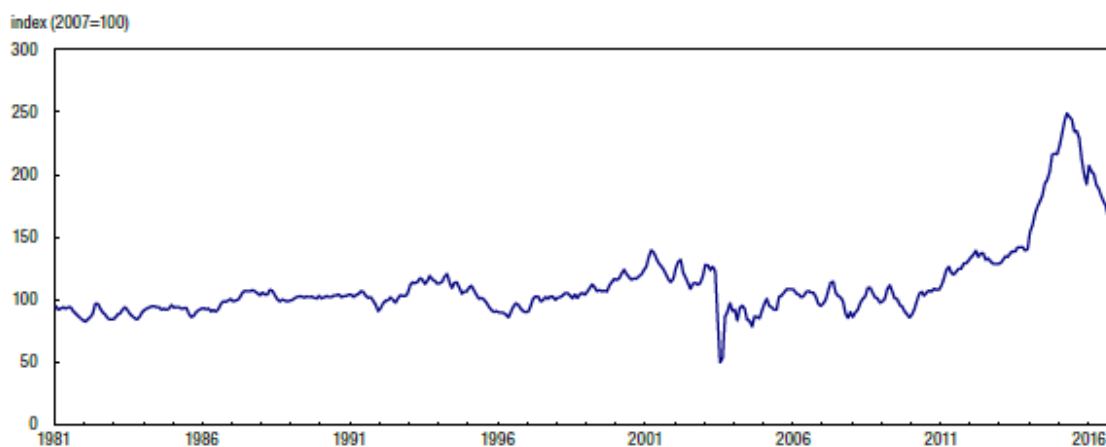
Source: Statistics Canada (2017f)

Figure 2.2: Profitability levels of cow-calf operations in Canada, 1981-2016

Table 2.4: Overview of types of beef cattle on different operations in Western Canada on January 1, 2017

	Bulls, 1 year and over		Beef cows		Heifers for replacement		Heifers for slaughter		Steers, 1 year and over		Calves, under 1 year	
Cow-calf operations												
British Columbia	10,700	6.4%	185,100	5.9%	32,600	7.3%	17,000	23.1%	9,100	12.6%	121,800	5.7%
Alberta	81,700	48.8%	1,431,700	45.6%	203,800	45.7%	30,100	40.8%	27,000	37.3%	1,022,600	48.0%
Saskatchewan	55,000	32.9%	1,110,700	35.3%	153,400	34.4%	18,300	24.8%	22,200	30.7%	650,700	30.5%
Manitoba	19,900	11.9%	414,600	13.2%	55,700	12.6%	8,300	11.3%	14,000	19.4%	337,000	15.8%
Total	167,300	100%	3,142,100	100%	445,500	100%	73,700	100%	72,300	100%	2,132,100	100%
Backgrounding operations												
British Columbia	600	5.4%	10,800	5.3%	2,200	7.6%	16,000	4.6%	15,900	5.0%	46,400	8.8%
Alberta	7,200	64.3%	121,100	59.4%	16,000	55.2%	261,700	75.1%	246,900	77.1%	349,600	66.7%
Saskatchewan	2,200	19.6%	47,500	23.3%	7,800	26.9%	46,600	13.4%	42,500	13.3%	69,300	13.2%
Manitoba	1,200	10.7%	24,400	12.0%	3,000	10.3%	24,400	6.9%	14,800	4.6%	59,100	11.3%
Total	11,200	100%	203,800	100%	29,000	100%	348,700	100%	320,100	100%	524,400	100%
Feedlot operations												
British Columbia							3,600	1.2%	6,200	1.4%	2,300	0.8%
Alberta							274,100	89.2%	375,800	82.0%	228,300	76.3%
Saskatchewan							12,500	4.1%	38,100	8.3%	41,500	13.9%
Manitoba							17,200	5.5%	38,000	8.3%	27,100	9.0%
Total							307,400	100%	458,100	100%	299,200	100%

Source: Statistics Canada (2017h)

On backgrounding or stocker operations, calves are further raised on a forage-based diet to build up the frame of the animal. Like cow-calf operations, backgrounding operations are diverse in nature due to geographical region, target weights and other integrated farm enterprises. In Western Canada, backgrounding operations are mainly prevalent in Alberta due to availability of forage and pastureland and proximity to feedlots. There were 463, 2,401, 830 and 801 backgrounding operations in British Columbia, Alberta, Saskatchewan, and Manitoba, respectively, as of January 1, 2017 (AAFC, 2017a). Table 2.4 gives an overview of the composition of types of beef cattle on backgrounding operations in the Western provinces, while the average herd size per province on backgrounding operations is shown in the overview of the value chain, Figure 2.1.

On finishing operations or feedlots, the goal is to add muscle and intramuscular fat in a short period of time. The variety of cattle within a feedlot can be quite large, as animals from different breeds and sexes, as well as from dairy operations are present. In Western Canada, feedlot operations are mainly prevalent in Alberta, accounting for 70% of production (CRSB, 2016) due to proximity to processing facilities. There were 159, 747, 138 and 81 feedlots in British Columbia, Alberta, Saskatchewan, and Manitoba, respectively, at the start of 2017 (AAFC, 2017a). However, the number of feedlots in all of Canada has fallen by 14.1% with 2.2% less animals present on these operations (Statistics Canada, 2017m). This decline in both number of operations and animal numbers followed the sudden price decline in late 2015, in turn lowering profitability levels of feeding operations. The types of beef cattle present on these operations is presented in Table 2.4. Generally, two types of feedlot operations exist, i.e. the commercial feedlots with bigger herd sizes feeding multiple rounds of cattle per year, and smaller feedlots feeding one round of cattle per year. The feedlot segment is also crucial to the competitiveness of the Canadian beef industry as collective decisions regarding, for example, market specifications affect subsequent stages of beef production, as well as the ability of the overall Canadian beef industry to fulfill export and consumer demands.

Other statistics relevant to Canadian beef operations include, among others, the reliance on off-farm income, the proportion of genders operating the farms, and the average age of producers. Table 2.5 describes the distribution of income classes of beef cattle operations in 2014. Judging from the large number of farms with net operating incomes below $24,999, beef cattle farms in Canada heavily rely on off-farm incomes. In fact, 75-84% of the cow-calf operations in Canada had an off-farm income in the last decade (CRSB, 2016).

Table 2.5: Distribution of Canadian beef cattle operations per net operating income group in 2014

Income group	British Columbia		Alberta		Saskatchewan		Manitoba	
Net operating income of $0 and under	955	34.1%	4,830	29.4%	2,565	25.9%	1,405	27.8%
Net operating income between $1 and $24,999	900	32.1%	4,850	29.5%	3,230	32.7%	1,795	35.6%
Net operating income between $25,000 and $49,999	385	13.8%	2,315	14.1%	1,635	16.5%	820	16.3%
Net operating income between $50,000 and $99,999	270	9.6%	2,310	14.0%	1,345	13.6%	610	12.1%
Net operating income of $100,000 and over	290	10.4%	2,145	13.0%	1,110	11.3%	415	8.2%
Total	2,800	100%	16,450	100%	9,885	100%	5,045	100%

Source: Statistics Canada (2017e)

Additional key statistics include:

- The highest share of farms that were involved in direct marketing to consumers in 2016 were beef cattle operations, translating into 8.7% of all beef cattle farms in Canada or 3,121 operations (Statistics Canada, 2017l).

- The average age of a Canadian farmer was 55 years in 2016, with the largest share between the age of 55 and 59. However, the number of farmers under 35 has been increasing since 2011 (Statistics Canada, 2017b).

- Of all Canadian farm operators (defined as the person responsible for day-to-day decisions (Jelinski et al., 2015)), 28.7% was female in 2016. When looking at beef cattle and feedlot operations, 55% of farms had a male operator only, 25% had both a male and a female operator (indicating multi-generational and family-owned operations), and 20% had a female operator only (Statistics Canada, 2017b).

- When combining the gender and age of all Canadian farm operators, the number of agricultural operations with a female operator under the age of 35 increased by 113.3% over the last five years (Statistics Canada, 2017b).

- Of all Canadian farms, 25.1% had an incorporated firm structure in 2016, while sole proprietorships and partnerships (with or without a written agreement) accounted for the remaining share. Of the incorporated farms, 2.7% were non-family corporations in 2016 (Statistics Canada, 2017b).

- In 2012, less than 1% of all Canadian cattle was raised organic, translating in approximately 27,000 animals (COG, 2012).

The next stage in the Canadian beef value chain is the processing segment (see Figure 2.1). Currently there are eight cattle slaughtering plants in Western Canada, with five in Alberta, two in British Columbia and one in Manitoba (AAFC, 2017c). These plants are operated by meat companies such as JBS and Cargill. A number of smaller facilities are present in all four Western Canadian provinces (CFIA, 2017). The total kill rate in 2016 was about 2,050,000 animals (AAFC, 2017e), accounting for 86% of total Canadian beef production (CRSB, 2016). The average kill per plant (excluding calves) was approximately 292,500 in 2016 in British Columbia and Alberta combined (AAFC, 2017b), and was composed of approximately 52% steers, 32% heifers, and 16% cows (AAFC, 2017e).

The carcasses are graded in order to deliver consistent products to consumers, as it categorizes carcasses of similar quality, yield and value. The Canadian beef grading system consists of mainly quality grades, and yield grades for those carcasses scoring an excellent quality as an indication of the percentage of red meat present in the carcass (i.e., the A, AA, and AAA grades). Factors that are considered when grading a carcass include maturity or age, sex, conformation or muscling (the shape of the carcass and the amount of flesh relative to the size of the bones), fat levels in terms of color, texture and cover, and meat levels in terms of color, texture and marbling. The yield grade is composed of three categories, with Yield 1 indicating 59% or more of the carcass is red meat, 54-58% for Yield 2, and 53% or less for Yield 3 (CBGA, 2017). Table 2.6 describes the composition of both quality and yield grades given to carcasses processed in Western Canada in 2016, from which it can be seen that Western Canada mainly produces top quality graded beef products, as well as more processed beef products (i.e., D grades).

Table 2.6: Composition of quality grades in Western Canada in 2016

Grade		Number of carcasses graded	Percentage	Grade	Number of carcasses graded	Percentage
Prime	Y1	2,241	0.10%	B1	886	0.04%
	Y2	7,497	0.36%	B2	313	0.01%
	Y3	24,888	1.18%	B3	1,021	0.05%
AAA	Y1	284,509	13.48%	B4	26,206	1.24%
	Y2	399,329	18.92%	D1	8,720	0.41%
	Y3	429,960	20.37%	D2	233,407	11.06%
AA	Y1	277,193	13.13%	D3	68,403	3.24%
	Y2	157,925	7.48%	D4	19,215	0.91%
	Y3	70,660	3.35%	E	13,637	0.65%
A	Y1	16,478	0.78%			
	Y2	3,918	0.19%	Ungraded	63,617	3.01%
	Y3	863	0.04%	Total	2,110,886	100%

Source: AAFC (2017f)

Key industry organizations that support the Canadian beef industry are the provincial producer organizations with their national counterparts (i.e., Canadian Cattlemen's Association (CCA), National Cattle Feeders' Association (NCFA)), CBBC, CMC, CRSB, BCRC, and BVCRT. Seedstock producers are also represented by Canadian Beef Breeds Council (CBBC), which promotes Canadian beef genetics both domestically and internationally. Meat packers, meat processors and their equipment suppliers are represented by the Canadian Meat Council (CMC) that also contributes to improving Canada's competitiveness for meat products, and prioritizes getting market access for Canadian meat products and improving the regulatory framework regarding food safety. The Beef Cattle Research Council (BCRC) is an industry-led funding agency for beef, cattle and forage research, and it identifies research priorities for the Canadian beef industry which are funded by about 18% of the Canadian Beef Cattle Check-off, the mandatory producer levy on each animal marketed. The BCRC also oversees and implements the Verified Beef Production Plus (VBP+) program, an on-farm food safety and sustainability program, and communicates research results to producers. VBP+ was developed by the Canadian Roundtable for Sustainable Beef (CRSB), a collaborative initiative aiming to increase sustainability of the Canadian beef industry. A different collaborative initiative, the Beef Value Chain Round Table (BVCRT), aims to ensure a competitive advantage for the Canadian beef industry.

2.1.2 Policy and trade environment

Figure 2.1 also shows key policy and trade elements that are of influence on the Canadian beef industry. The main export market for the Canadian beef industry is the United States, both in terms of live animals and processed beef products, while other important trading partners are China, Mexico and Japan. Canada also imports (processed) beef products from, amongst others, the United States, Australia and New Zealand. In 2016, Canada imported about 187,000 metric tons of beef products (AAFC, 2017d). This makes Canada a net exporter in terms of 30% of its beef production in 2016 (Canada Beef, 2017).

In terms of policy, the Canadian beef industry is subject to Growing Forward 2, the current federal agricultural policy framework that develops programs to make the agricultural industry profitable, sustainable and competitive. These programs also enable the agricultural industry to anticipate and adapt to changing market circumstances. Programs under Growing Forward 2 that are of influence on the Canadian beef industry include crop insurance programs and business risk management programs. The latter are available to producers in times of price volatility, adverse weather conditions or other unforeseen events. Examples of such business risk management programs include AgriStability and the Western Livestock Price Insurance Program (WLPIP). AgriStability is ordained by the federal government and aims to stabilize large margin losses over a 5-year period. WLPIP is available to producers in the four Western provinces and provides coverage for large price declines within a given year (National Beef Strategy, 2015; Twine et al., 2016).

The Canadian beef industry has also formulated its own policy on how to position the industry strategically and increase the level of market orientation. The industry-led National Beef Strategy consists of four pillars with associated targets:

1. Beef demand: Increase carcass cutout value[5] by 15%
2. Competitiveness: Reduce cost disadvantages compared to main competitors by 7%
3. Productivity: Increase production efficiency by 15%
4. Connectivity: Enhance industry synergies, connect positively with consumers, the public, government, and partner industries.

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[5] The approximate composite value of a carcass based on the prices received for different parts of the carcass (e.g., rib, chuck, round, loin)

Of these four pillars, the first pillar is the most relevant to increasing the level of market orientation as it focuses on the demand for Canadian beef by promoting and marketing Canadian beef products both domestically and internationally and strengthening consumer confidence. This is done through the Canadian Beef Advantage, a marketing campaign by Canada Beef Inc. (the marketing agency of the Canadian beef industry) to establish Canadian beef products as a differentiated, safe, nutritious, sustainable and high-quality brand and increase consumer loyalty. Canada Beef Inc. also develops programs to produce different cuts, such as short ribs and tongues that are of increased value in international markets. This first pillar is also about gaining and maintaining market access in international markets, aiming to reduce non-tariff and tariff barriers in international markets for beef, live cattle and beef cattle genetics as well as develop new trade agreements and restore market access following the BSE crisis. To increase social license in the domestic market, the Canadian beef industry also aims to effectively communicate the reasons behind using antimicrobials and the effects on human health (National Beef Strategy, 2015).

The second and third pillar are relevant to the use of market intelligence by the Canadian beef industry, as they focus on increasing technology transfer activities to stimulate the adoption of e.g. new forage varieties, management practices and beef production technologies by individual producers. As consumers are increasingly asking for sustainably produced food, under the second pillar the CRSB has developed an on-farm sustainability program Verified Beef Production Plus (VBP+) for producers to adopt and demonstrate responsible production practices in terms of animal care, biosecurity and environmental stewardship. Initiatives like these have been designed to give beef producers the option of being more responsive to the future direction of the overall industry (ABP, 2016). As part of the third pillar, the Canadian beef industry also aims to increase research dollars towards the productivity of forage and grasslands, the productivity of feed grains and feed efficiency, and the health and welfare of animals, and disseminate the research results of these projects. The Canadian beef industry also encourages commercial producers to adopt superior genetics in their herds, e.g. by making use of Artificial Insemination (AI), and aims to close the gap between seedstock producers and cow-calf producers by developing breeding programs based on cross-breeding as opposed to pure genetic lines. Although some of these initiatives might add to the cost of production on individual beef operations, by focusing on having access to competitively-priced inputs and maintaining and improving research capacity the Canadian beef industry can mend its competitive position compared to its competitors and

increase beef production with existing resources (i.e., increase beef production efficiency) (National Beef Strategy, 2015).

2.1.3 Outlook: Challenges and opportunities

The National Beef Strategy has been developed as the Canadian beef industry faces some challenges and opportunities that can potentially affect the supply and demand for Canadian beef products. These and other challenges and opportunities are summarized in Table 2.7. Key opportunities for the Canadian beef industry include restored or newly developed trade relationships, as well as heterogeneous consumer demands regarding production practices. The Canadian beef industry has to adapt its production methods in order to take advantage of these prospects.

Table 2.7: Outlook for the Canadian beef industry

Challenges	Opportunities
Trade negotiations with US and Mexico regarding NAFTA: • Potential reintroduction of mandatory country-of-origin labeling	Restored trade relationships after BSE/newly developed: • CETA: 65,000 tons annually • Agreement with Japan / new CPTPP
Federal/provincial regulations: • Canadian Agricultural Partnership (CAP): continuation of risk management programs & livestock insurance programs • Carbon levies → increased transport & processing costs • Transportation times: maintain animal welfare • Bill 6 in Alberta: increased production costs	Overall and heterogeneous consumer demands: e.g. organic, animal welfare, sustainability
Increasing average age of beef producers: • Attracting young & skilled labour • Decrease in number of cattle herds • Adoption of management practices, e.g. VBP+	
Climate change: • Increased variability in weather patterns • Ability to grow/source nutritious feed	

Key challenges for the Canadian beef industry include ongoing trade negotiations, developments in federal and provincial regulations, the consequences of climate change, and the increasing average age of farmers and ranchers. This last issue is of particular importance as some 20,000 cow-calf producers have exited the industry in the past decade, while other producers decided not to expand their herds. This in turn has consequences for fully exploiting market opportunities

both abroad and in the domestic market as expansion of the foundation of the entire Canadian beef industry, the cow-calf herds, is limited and operations might be dissolved in a few years.

2.2   Ireland's beef industry

The Irish beef and livestock sector contributes largely to the Irish economy with an annual output value of more than €2.2 billion[6] in 2016 (CSO, 2017e), accounting for about 32% of the gross output of the total agricultural sector. Table 2.8 presents some additional statistics for selected years. The overall beef industry processes raw material in terms of progeny from both about 1 million beef suckler cows (i.e., beef breeding cow) and 1.3 million dairy cows (CSO, 2017a), resulting in over 535,000 tons of beef products in 2016 at a worth of €2.38 billion (Bord Bia, 2017b). Over 110,000 farms have some sort of beef cattle enterprise on their operation (CSO, 2015b), translating in almost 80% of Irish farms (CSO, 2015a). This same number was over 151,000 in 1991 and over 124,000 in 2000 (CSO, 2017f). With over 5 million heads of cattle in Ireland (CSO, 2017a), beef farming is prevalent in the Irish landscape and in all counties, as can be seen in Figure 2.3. As such, the density of cattle per hectare of agricultural land in Ireland is one of the highest globally, with an average stocking rate of 1.4 in Ireland compared to a global average of 0.32[7] (FAO, 2014). The most common beef production systems are suckler cow production, store production and cattle finishing, with different profitability levels and quality targets per segment.

Table 2.8: Overview of economic indicators of the Irish beef industry

Economic indicator	2010	2011	2012	2013	2014	2015	2016
Number of beef cattle (x 1,000)[a]	5,535.8	5,376.1	5,613.3	5,739.4	5,699.7	5,667.7	5,823.3
Number of animals finished (x 1,000)[b]	1,716.6	1,642.9	1,483.7	1,588.6	1,748.7	1,664.7	1,744.3
Output value, annual in '000 euros[c]	1,502.3	1,795.1	2,119.5	2,151.8	2,012.3	2,358.0	2,281.9
Number of specialized beef operations	60,500[d]	67,000[e]	44,065[f]	44,058[g]	44,141[h]	50,624[i]	48,926[j]

[a] Source: CSO (2017f)   [b] Source: CSO (2017d)
[c] Source: CSO (2017e)   [d] Source: Hennessy et al. (2011)
[e] Source: Hennessy et al. (2012)   [f] Source: Hennessy et al. (2013)
[g] Source: Hanrahan et al. (2014)   [h] Source: Hennessy and Moran (2015)
[i] Source: Hennessy and Moran (2016b)   [j] Source: Dillon et al. (2017)

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[6] Comparable to approximately CA$3.5 billion
[7] The stocking rate for Western Canada was 0.69 in the mid-2000's (Beauchemin et al., 2010)

Cattle (non-dairy) as percentage of total ED LUs

- 0.00
- 0.01 - 26.00
- 26.01 - 60.00
- 60.01 - 75.00
- 75.01 - 89.00
- 89.01 - 100.00
- N/A

Map: Spatial Analysis Unit, Teagasc, 2012
Statistical Data: CSO
Boundary Data: OSI
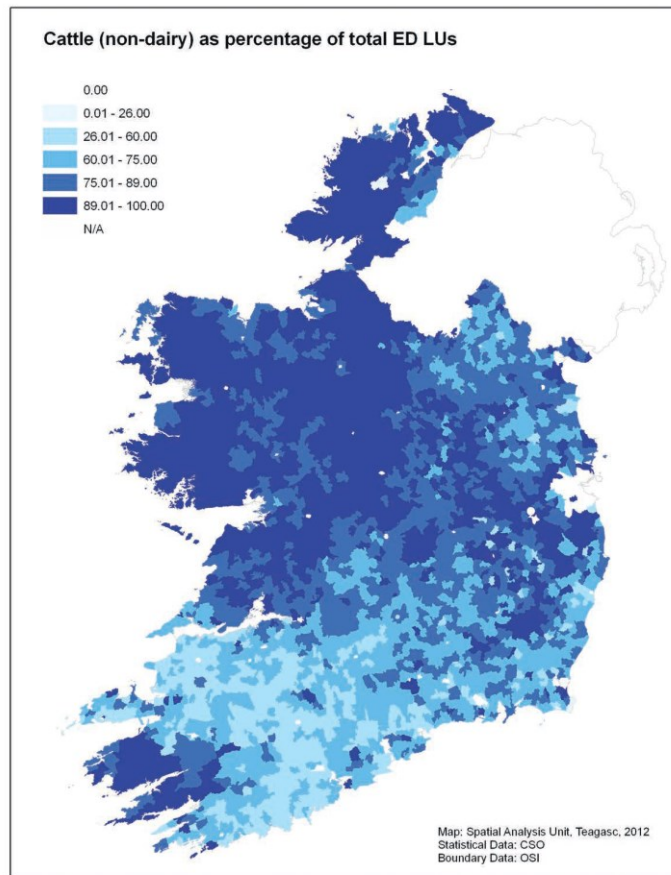
Source: Thorne et al. (2016)

Figure 2.3: Concentration of beef production in Ireland

2.2.1 Beef value chain

Figure 2.4 shows the relevant aspects of the Irish beef value chain and product flow, separated into the production and market segments[8]. It also shows which organizations support the different segments and the current policy and trade environment.

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[8] See the glossary of abbreviations at the beginning of this thesis for the meaning of used abbreviations
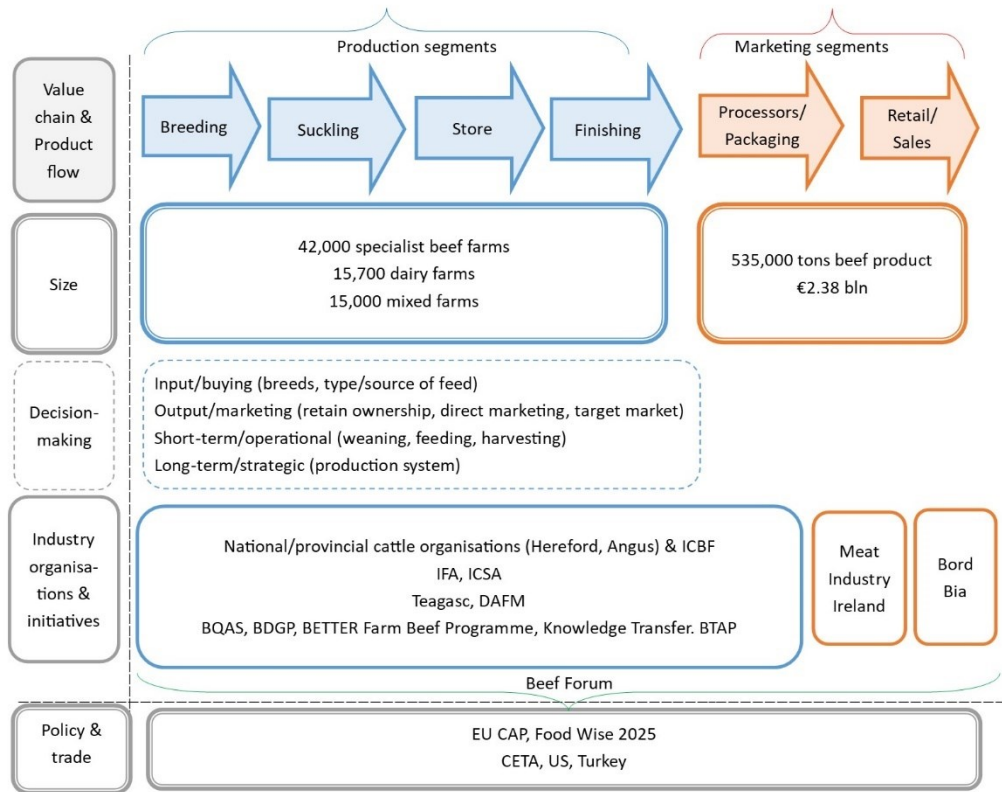
Source: Bord Bia (2017b)

Figure 2.4: Irish beef value chain

In the National Farm Survey (NFS), which is conducted annually by the Agriculture and Food Development Authority Teagasc, over 80,000 commercial farms are represented of which over 73,000 farms have some sort of cattle enterprise (Hennessy and Moran, 2016a). Table 2.9 outlines the different production systems within the Irish beef industry and the number of farms involved in these systems according to the NFS. As can be seen from this table, more than 58% or over 42,000 beef farms can be characterized as specialist beef farms, and the suckler cow segment of the Irish beef industry is the biggest and most important part of Irish beef production. In addition, a fair share of Irish beef production originates from dairy farms and mixed production systems (i.e., cattle and crops).

Similar to the Canadian beef production segments, a high degree of heterogeneity exists in the Irish beef production segments, and different farmers can be involved from rearing to finishing. The suckler cow segment in Ireland varies from selling calves just after weaning to selling them as heavier store cattle (i.e., feeder cattle) or finished cattle. It is estimated that about 25% of

suckler cow farmers raise their calves to finished animals (Hennessy and Moran, 2016a). In suckling-to-weanling systems[9], cows are selected for desirable traits to produce a high body conformation score that match the requirements of processors. Possible marketing outlets for weanlings include the domestic market using auction marts and the live export market. This latter outlet is an important market and can provide a stable income in times of volatile beef prices.

Table 2.9: Structure of beef production in Ireland according to NFS data

Beef system	Number of farms	Percentage
Suckling to weanlings	10,459	14.2%
Suckling to stores	10,308	14.0%
Suckling to finished	7,218	9.8%
Finishing (store to finished)	14,900	20.3%
Calves reared on dairy farms	15,700	21.4%
Mixed production systems	14,915	20.3%
Total	73,500	100%

Source: Hennessy and Moran (2016a)

In suckling-to-beef systems, both steer-based and bull-based, calves are raised to finished animals and sold to processing facilities. In store-to-beef systems, beef cattle are further raised to build up the frame of the animal to sell high-quality animals at a premium price. In dairy calf-to-beef systems, calves born in the dairy sector are finished like beef cattle. Marketing outlets include the domestic market, export-approved abattoirs and the live export market. As all beef production systems in Ireland are mainly grass-based, cattle supply to processors and therefore prices can be quite seasonal as most animals are sold in the fall to minimize wintering feed costs. Figure 2.5 gives an overview of the volatility of beef prices for different cattle specifications over the period 2013-2015 in weekly indices.

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[9] Comparable to the cow-calf system in Canada
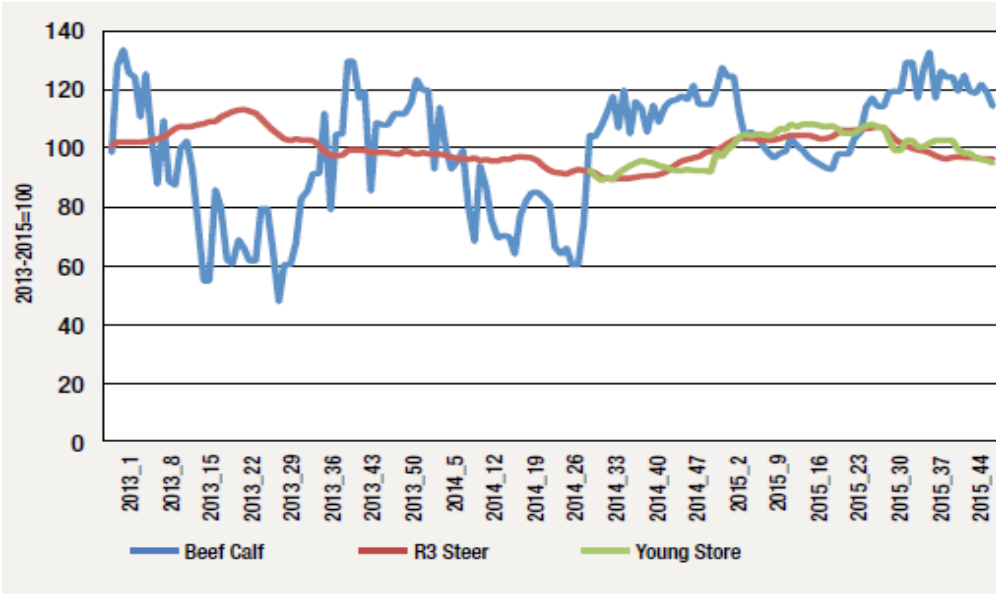
Source: Hanrahan (2016)

Figure 2.5: Weekly indices of Irish cattle prices, 2013-2015

Table 2.10 gives an overview of the composition of types of beef cattle on Cattle Rearing[10] and Cattle Other[11] operations as used in the NFS per Utilized Agricultural Area (UAA)[12], as well as for Ireland overall in absolute numbers. It can be seen from this table that suckling-to-beef systems are more heavily represented by Cattle Rearing operations, while other beef systems with store or heavier feeder cattle are more heavily represented by Cattle Other operations.

Table 2.10: Overview of types of beef cattle on different types of operations and total in June 2016

	Suckling cows	Heifers-in-calf	Calves < 1 year old	1-2 year old males	1-2 year old females	> 2 year old males (excl. bulls)	> 2 year old females (excl. suckling beef cows)	Bulls
Cattle Rearing	24.8	1.5	21.4	2.8	5.4	0.2	0.8	0.8
Cattle Other	12.4	1.3	22.9	16.1	8.8	7.0	2.3	0.4
Total	1,103,700	-	2,125,900	87,270	98,050	39,110	32,440	25,000

Source: CSO (2017b), Hennessy and Moran (2016b)

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[10] Cattle operations with more than 50% of standard output originating from suckler cows (Hennessy and Moran, 2016b)

[11] Cattle operations with less than 50% of standard output originating from suckler cows (Hennessy and Moran, 2016b)

[12] UAA is the area used for crops and pasture plus the area used for grazing (both owned and leased)

Irish beef farmers make important decisions regarding e.g. the breed(s) of their herd, the growth rate and mature weight they are aiming for, the target market, the type and source of feed. These decisions are generally part of a bigger planning process taking into account a breeding plan, a herd health plan and a grassland management plan. Beef farmers are often supported with these decisions by extension advisers from Teagasc, as well as peers in their community or the discussion groups they are part of. As many of these decisions affect the other segments in the Irish beef industry, the beef production segment is crucial to the competitiveness of the Irish beef industry, with decisions of which production system to adopt and how improve performance targets in particular affect the ability of the Irish beef industry to fulfill export and consumer demands.

However, Irish beef operations are typically small-scale with low profitability levels (Dillon et al., 2017). In 2016, the average farm income of Cattle Rearing operations was about €13,000, with 51% earning less than €10,000. These are the lowest incomes of all farming systems in Ireland. The average farm income for Cattle Other operations was about €17,000, with 44% earning less than €10,000 (Dillon et al., 2017). In addition, in 2015 20% of Cattle Rearing farms and 28% of Cattle Other farms were considered economically viable[13], resulting in an overall number of 11,300 economically viable cattle farm businesses. Close to 45% of Cattle Rearing farms and 31% of Cattle Other farms were considered economically sustainable[14], and 36% of Cattle Rearing farms and over 40% of Cattle Other farms were considered economically vulnerable[15] (Hennessy and Moran, 2016c). Therefore, beef farms in Ireland are heavily reliant on subsidies from the EU CAP or off-farm incomes. In fact, total average direct payments in 2016 were approximately €14,600 for Cattle Rearing operations and approximately €16,700 for Cattle Other operations, contributing 113% and 99% to the total farm income, respectively (Dillon et al., 2017). 59.4% and 49.5% of these operations had an off-farm income in 2015, respectively (Hennessy and Moran, 2016b).

Additional key statistics relevant to Irish beef operations include:
- The average age for a beef farmer on a Cattle Rearing operation of 56.8 years and 58.7 years on a Cattle Other operation in 2015 (Hennessy and Moran, 2016b).

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[13] Economically viable: the farm income can compensate for family labor at the minimum agricultural wage and provide a 5% return on the capital invested in non-land assets

[14] Economically sustainable: the farm is not considered economically viable, but the farm household earns an off-farm income

[15] Economically vulnerable: the farm is not considered economically viable nor economically sustainable, and the farm household does not earn an off-farm income

- The majority of beef farmers are part-time[16] farmers, with or without an off-farm income. Older farmers often do not have an off-farm income. In 2015, 46% of operations in livestock systems were operated full-time, which tend to be the larger and more viable farms. As such, part-time farms rely more on direct payments in order to pay for production expenses, translating in 107% and 111% for Cattle Rearing and Cattle Other farms, respectively (DAFM, 2017a).
- In 2015, of all Irish farms registered with the Department of Food, Agriculture and the Marine (DAFM), 12% were female with an average of 62 years of age.
- When combining the gender and age of the registered Irish farm operators, 44% of female sole owners were over 65 years of age, while 31% of these were over 80 years of age. For both male and female sole operators, the majority is between 35 and 64 years of age (DAFM, 2017a).
- In 2015, about 1% of all Irish cattle was raised organic (EC, 2016a), translating in 1,300 organic beef farmers (of which about 900 suckler cow farms) (Clavin and Leavy, 2016).
- In 2013, 23,100 specialist beef farmers were involved in land rental, reflecting about 54% of all specialist beef farmers (DAFM, 2017a).

The next stage in the Irish beef value chain is the processing segment (see Figure 2.4). Currently there are about 30 export-approved (by DAFM) processing facilities and over 100 smaller facilities (DAFM, 2017d). The export-approved facilities are dominated by companies such as Anglo Beef Processors, Dawn Meats, and Kepak. In 2016, about 1.6 million animals were slaughtered in DAFM-approved plants, of which 38% were steers, 26% were heifers, 22% were other cows, 12% were young bulls, and 2% were bulls.

To determine market prices, Irish beef carcasses are classified following the European beef grading system called EUROP. This grid system grades animals on their conformation (denoted by letters, E being the best) and fat levels (denoted by numbers, 5 being the highest fat levels, as well as their gender. Both conformation and fat levels are further divided into three categories (i.e., +, =, -). Fat levels 4 and 5 are sometimes split up in high (H) and low (L). A typical classification would therefore be R4L, which indicates a "good" carcass in terms of conformation with an "average" to "high" level of fat. As such, market prices are based on the combination of carcass weight and the classification information, which is communicated back to the beef farmer (DAFM, 2017c; EC, 2016b). Table 2.11 gives an overview of which carcass gradings were received

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[16] Farms requiring less than 0.75 of a standard labor input unit (DAFM, 2017a)

for steers in 2016, from which it can be seen that Ireland produced mainly fair and good steer carcasses with average fat levels.

Table 2.11: 2016 steer carcass classification figures in percentages

	1 – Low	2 – Slight	3 – Average	4 - High	5 – Very high	Total
E – Excellent	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
U – Very good	0.1%	2.3%	6.6%	1.7%	0.0%	10.7%
R – Good	0.3%	4.6%	20.7%	9.7%	0.2%	35.5%
O – Fair	0.4%	5.0%	26.0%	11.3%	0.2%	43.0%
P - Poor	0.4%	3.0%	6.5%	1.0%	0.0%	10.8%
Total	1.2%	14.8%	59.8%	23.7%	0.4%	100%

Source: DAFM (2017b)

Key industry organizations that support the Irish beef industry are Bord Bia, Teagasc, and ICBF. Bord Bia is the Irish Food Board, and is, amongst others, involved in developing new markets for Irish food products and promoting Ireland in these markets. It also plays a major role in the quality assurance of Irish agriculture and has set up a number of quality assurance schemes called Origin Green based on traceability, animal welfare, environmental and pasture management, care for the producer, and food safety to further drive the sustainability of the Irish agricultural sector. Carbon footprint measures have also been a part of these quality assurance schemes since 2011 (Bord Bia, 2015). In 2015, there were over 45,000 members of the Beef Quality Assurance Scheme (BQAS), translating in 90% of all Irish beef production (Maloney, 2016).

Teagasc is the Agriculture and Food Development Authority in Ireland and conducts research and provides training and extension services to farmers. As such, it has developed a number of initiatives related to knowledge transfer, such as farm walks, extension events (e.g., BEEF 2016), discussion groups, as well as farms where new farming practices are being tested in a realistic farm environment. Teagasc also facilitates some government initiatives such as the Beef Data & Genomics Programme (BDGP), the Beef Technology Adoption Programme (BTAP), and BETTER Farm Beef Programme. BDGP addresses issues with respect to genetics in the suckler herd, farmer profitability, and greenhouse gases. As such, farmers that improve their herd genetics contribute to climate benefits and environmental sustainability. BTAP was designed to encourage producers to adopt new technologies and was facilitated as a discussion group between 2012 and 2014. The Business, Environment and Technology through Teaching, Extension and Research (BETTER) Farm Beef Programme is a joint programme by Teagasc and the Irish Farmers Journal, aiming to improve productivity and profitability of beef farms, and demonstrate the potential of Irish beef

farms. By customized written business plans and business groups, participants set goals on a wide variety of topics, and results of these BETTER beef farms are distributed regularly among a wider public by publications in the Irish Farmers Journal.

The Irish Cattle Breeding Federation (ICBF) is the organization that provides breeding information to the Irish dairy and beef industries and has developed breeding indexes (called the €uro-Star system) for both breeding and replacement purposes (Replacement Index) and slaughter purposes (Terminal Index). An economic value is added to the breeding indexes to calculate the extra profit of certain traits.

2.2.2 Policy and trade environment

Figure 2.4 also shows key policy and trade elements that are of influence on the Irish beef industry. About 90% of the annual beef output is exported, which accounted for 4% of total exports in 2016 and makes Ireland the fifth largest net beef exporter globally (Bord Bia, 2017a). Important trading partners are the United Kingdom and other countries in the European Union, to which the vast majority of beef products are exported (Burke, 2016). In addition, the export of 145,000 live animals (with calves in particular) accounted for approximately €150 million in 2016 (Bord Bia, 2017a).

In terms of policy, the Irish beef industry is subject to the EU CAP regarding direct payments, but the overall Irish agri-food industry also has defined its own long-term goals. Two industry-led 10-year strategies have been developed, Food Harvest 2020 and Food Wise 2025. To facilitate growth of the Irish agri-food sector, the main objective of Food Harvest 2020 for the beef sector was to increase the output by 20% by the year 2020 (DAFM, 2010). In addition, the four main objectives of Food Wise 2025 are:

1. Increasing the value of agri-food exports by 85% to €19 billion
2. Increasing the value added in the agri-food, fisheries and wood products sector by 70% to more than €13 billion
3. Increasing the value of primary production by 65% to almost €10 billion
4. The creation of an additional 23,000 direct jobs in the agri-food sector all along the supply chain from primary production to high-end value-added product development.

In addition to these four overarching goals, the Food Wise 2025 gives sector-specific growth recommendations and identifies four themes that contribute to the above-mentioned objectives, i.e. Human Capital, Competitiveness, Market Development, and Innovation (DAFM, 2015). The

first theme, Human Capital, is relevant to the use of market intelligence as it helps individual farmers improve profitability levels by educating them about how to use their resources and the latest technologies in the most productive and sustainable way when managing their businesses and making everyday decisions. For the beef sector, some recommendations related to this include (DAFM, 2015):

- Development of Knowledge Transfer Groups to optimize producer productivity and profitability;
- Expansion of the current discussion group model to provide access to up-to-date research and information in the areas of grassland and soil management, genetics and breeding, financial management/business planning and price volatility management, animal health and welfare, and environment and farm safety;
- Implement a third phase of the Teagasc/Irish Farmers Journal BETTER Farm Beef Programme with an emphasis on transferring best practice in management and breeding to the maximum number of farms.

The second theme, Competitiveness, is relevant to the level of market orientation of the Irish beef industry as it aims to maintain and improve competitiveness levels in both farm and processing segments. For the beef sector, some recommendations related to this include (DAFM, 2015):

- Development of measures to manage impacts of price/income volatility, e.g. fixed price contracts and producer organizations;
- Aid farm restructuring and land mobility, e.g. by facilitating collaborative farming arrangements;
- Prioritization of sustainable productivity improvements at producer level, e.g. by increasing the use of genomic technologies (such as the use of breeding indices in purchase decisions) and by improving grazing management practices.

The third theme, Market Development, is also relevant to the level of market orientation as it aims to identify and understand specific market requirements in certain premium markets to drive profitability levels and promote Ireland's agri-food production outside the European Union, especially now that Ireland seeks to diversify its markets after Brexit. For the beef sector, some recommendations related to this include (DAFM, 2015):

- Further enhance Origin Green Programme as a tool to measure and demonstrate in domestic and global markets Ireland's credentials as a producer of sustainable, safe, nutritious, and high-quality food;

- Continue to enhance and support Ireland's animal health status.

The last theme, Innovation, is related to the use of market intelligence and maintaining competitiveness in the long run and identifies gaps in translating research to commercial products and practices to be adopted by farmers. This is of particular relevance to the suckler cow segment where opportunities for growth exist as the most important part of Irish beef production. For the beef sector, some recommendations related to this include (DAFM, 2015):

- Improve coordination between industry, state agencies and research institutions to support the delivery of research which will deliver commercial outputs and products.

2.2.3   Outlook: Challenges and opportunities

Food Wise 2025 with its sectoral recommendations have been developed as the Irish beef industry faces some challenges and opportunities that can potentially affect the supply and demand for Irish beef products. These challenges and opportunities are summarized in Table 2.12. Key opportunities for the Irish beef industry include the increased supply from the dairy sector leading to an expected increased beef output of 5-10% following expansion in the dairy herd (DAFM, 2015), and heterogeneous consumer demands concerning production practices. It is important that Ireland takes advantage of these opportunities, further strengthens its image of high animal welfare standards, and leverages its reputation of sustainable grass-based beef production in traditional EU markets. However, Irish beef farmers need to ensure making use of the right breeds, breeding technologies and production systems to maximize the output of the additional supply from the dairy sector, meet market demands and improve the competitiveness of the Irish beef industry, as well as improve the performance of existing natural resources like grass and animals in terms of calving rates and the use of genomics.

Key challenges for the Irish beef industry include the consequences of climate change, Brexit, the future of EU direct payments and other EU regulations, as well as the increasing average age of beef farmers. Direct payments from the EU CAP are currently a significant source of income to Irish beef farmers and provide a buffer for high variability in beef prices. However, the EU CAP will be reformed after 2020, resulting in exiting beef farmers if direct payments are abolished or an increased focus on production and cost efficiencies if direct payments will be tied to the production of public goods (e.g., biodiversity). This will affect the ability of the Irish beef industry to fulfill export and consumer demands, and in turn to have sustainable farm businesses. With an older generation of beef farmers and a high level of part-time farming, the incentives to invest in

technology and participate in the necessary skill developments designed to improve the overall industry may be limited. This in turn again restricts the ability to develop sustainable and viable beef farm businesses, and challenges to increase output and achieve productivity gains, and ultimately the competitive position of the Irish beef industry.

Table 2.12: Outlook for the Irish beef industry

Challenges	Opportunities
Climate change: • Increased variability in weather patterns • Ability to grow/source nutritious grass → limited by high degree of fragmentation and land rental	Increased supply from dairy production systems following EU milk quota abolition • Increased beef output 5-10%
EU regulations: • Reduce GHG emissions by 20% by 2020 • EU CAP reform → potential abolishment of direct payments/connected to providing public goods	Heterogeneous consumer demands: e.g. grass-fed, animal welfare, sustainability • Increased demand for Irish organic beef products → 15-20% premium prices
Trade agreements: • Brexit → exchange rate volatility → diversification • Mercosur → TRQ on cheaper Brazilian beef	Trade agreements: • CETA • US • Turkey: live animals
Increasing average age of beef producers: • Younger producers to access farmland • High degree of part-time farming • Fragmentation → Limited incentives to invest and adopt of management practices	

2.3 Comparison of both beef industries

The previous two sections provided a detailed overview of the current status of the Canadian and Irish beef industries. At first sight, the two industries seem very different in terms of production methods, scale, and the reliance on direct payments and availability of extension services in the case of Ireland. However, there are some similarities to be discovered as well. First, both countries are net exporters in terms of both their processed beef products as well as live animals, and so both countries heavily rely on their trading partners in order to generate an income from beef production and processing. Nevertheless, both Canada and Ireland are currently facing challenges regarding renegotiations with their biggest customer, i.e. Canada with the United States in light of a renegotiation of NAFTA, and Ireland with the United Kingdom in light of a potential renegotiation after Brexit. In addition, both beef industries are founded on older, often male operators, in particularly in key production segments. These issues are critical to improve

competitiveness and productivity of these two beef industries, as adoptions of new technologies and investments in human capital will help adapt these industries to changing market conditions.

Furthermore, although the two beef industries differ in their respective scale, both industries are based on a diversity of beef production systems and beef operations. In Ireland, beef production can be found on almost any farm, in both full-time and part-time form, possibly combined with other farm enterprises, and based on a relatively large influx from the dairy sector. In Canada, the larger beef operations are mainly prevalent in the four Western provinces and often tied to a crop enterprise or off-farm income. Questions can be raised about the viability of beef operations in both countries. In addition, both beef industries use a variety of production timelines and associated marketing targets. In Canada, weaned calves are sold at 6 months old or further backgrounded or even sold as heavier feeder cattle from the same operation, while in Ireland beef farmers generally raise animals following a predefined production system such as suckling-to-steer beef or dairy-calf-to-beef. Moreover, both beef industries have a crucial production segment in which important decisions affecting the overall beef industry are made.

As both beef industries are facing market opportunities and challenges in the near future, initiatives and strategies to improve their individual competitiveness level have been set in place. In doing so, the strengths and weaknesses of each industry are taken into account, as well as the factors that could influence consumer demand now and in the future. As will be discussed in more detail in Chapter 3, this knowledge of the market and how it is acted upon is generally thought of creating a competitive advantage and market orientation (Grunert et al., 2005). However, given the above it is expected that the Irish beef industry will have a lower degree of market orientation due to its reliance on subsidies from the European Union, compared to its Canadian equivalent.

This chapter has shown that the beef industries in both Canada and Ireland have a need to be (more) market-oriented, and respond to their respective challenges and opportunities. The above also showed that the external market conditions such as market turbulence and competitive intensity are rather similar for the beef industries in Canada and Ireland, while their internal settings are different. This gives the ideal basis to conduct a case study analysis regarding the degree of market orientation and use of market intelligence in these two beef industries. As the collective decisions of individual beef producers are key to the competitiveness of these industries, this thesis investigates the opinions of these producers regarding the competitive position of the industry they are operating in as well as their decision-making processes.

Chapter 3: Literature review

After having learned more about the structure and organization of the Canadian and Irish beef industries and the challenges and opportunities they are facing, this chapter provides an overview of the academic literature surrounding the issues discussed in the previous two chapters. It thereby aims to provide a partial answer to the second and third research question, i.e. "How can the concept of market orientation in an agricultural setting at industry level be modeled and quantified?" and "What are determinants of market orientation and producer decision-making processes in the Canadian and Irish beef industries?" Therefore, this chapter starts with a discussion of the academic literature surrounding the primary objective of this thesis, i.e. a discussion concerning market orientation and the use of market intelligence in an agricultural setting in Sections 3.1 and 3.2. This is followed by a discussion regarding producer decision-making in Section 3.3 and ends with the contributions of this thesis to the academic literature in Section 3.4.

3.1   Market orientation

In neoclassical economics, producers are assumed to be rational agents who aim to maximize profits or minimize production costs. For commodity producers, it is assumed that they face equal costs and market demands. In this approach, producers turn inputs into outputs using a certain production function, and every economic agent is assumed to have perfect information and certainty concerning prices, product characteristics and trading partners. As such, transactions occur in a frictionless economic environment and quality variations do not exist or are assumed to be completely different products, and so are traded on different markets (Varian, 2006). In the institutional economics literature however, it is argued that there is no such thing as a frictionless economic environment since the process of exchanging goods involves costs of, for example, discovering prices and negotiating contracts. This means that both producers and consumers have imperfect information, and for producers this results in information being a supply-increasing input to their production process. This also implies that information adds to producers' welfare, assuming that they would only use it as an input if it improves their production decisions and thus their bottom line (Babcock, 1990). As such, the ability to access and process information and produce knowledge from it is a critical determinant of economic performance (Just et al., 2002), resulting in that a numeric value can be put on information as an input. Babcock (1990) for example, calculated the difference between expected returns using weather information based on accurate weather forecasts and when not making use of weather information in agricultural production decisions. Other studies that estimated the value of information to agricultural

producers include Adam et al. (1996) who calculated the value of better price (volatility) information for hog producers' hedging decisions; Fox et al. (1999) who computed the value of precipitation forecast information for winter wheat production in Canada; Lusk (2007) who calculated for cattle producers the value of using information about leptin genotypes that controls, amongst others, the weight of animals; and Lambert (2009) and Thompson et al. (2014) who calculated the expected utilities of cattle producers with and without access to information on genetic traits that stimulate feed efficiency. However, these studies investigate a particular type of information used by a particular group (i.e., individual farmers) and so imply that the production decisions using that type of information do not have an effect on price levels. An agricultural industry consisting of many identical producers that have access to and use these kinds of information might be subject to price externalities and welfare losses due to aggregate effects (Babcock, 1990).

Uncertainties in the business environment of economic agents constrain their optimization problems and is a form of having imperfect information. This means that firms must position themselves strategically in order to sell their goods and products. In other words, firms have to make certain decisions to achieve superior performance, also known as strategic management or strategic orientation (e.g., Slater et al., 2006). Porter (1985) conceptualized four generic strategies to achieve positional advantage based on how value is created (i.e., by focusing on differentiation or low costs) and what scope of the market is covered (i.e., narrow or wide). Somewhat similar to Porter's differentiation strategy is to take advantage of resources that have potential value and use them strategically to achieve competitive advantage and increase performance following the resource-based view (e.g., Ketchen et al., 2007). Positional advantage can also be achieved by creating superior customer value. In doing that, one has to know, amongst others, how superior customer value is perceived, by which consumer segment, and what skills and resources are required to generate products that fulfill those conditions. In other words, information is the most crucial strategic resource to achieve economic performance (Wang et al., 2009).

The above concepts not only hold for the firm or producer level but can also be applied at the industry level. Strategic orientation is then the process of formulating strategic directions based on focusing on the broader (business) environment of the industry. This is relevant when assessing uncertainties in the environment of agricultural industries in general or beef industries in particular. However, the focus of this thesis is not assessing uncertainties, but on the use of information by agricultural industries and acting on the knowledge produced from it given these

uncertainties. One concept that investigates that is market orientation, which argues that establishing and maintaining a competitive advantage for making good future strategic decisions requires a continuous understanding of the market a firm is operating in (Grunert et al., 1996; Grzeskowiak et al., 2007). This implies making use of market intelligence, following one interpretation of market orientation. The concept of market orientation and using market intelligence will be used in this thesis to give insights into how agricultural industries position themselves strategically given uncertainties in their business environment.

As the cornerstone to the marketing discipline, the concept of market orientation (MO) has been studied extensively in past decades, and as such different understandings of what a market orientation exactly comprises have been developed over time, for which Kohli & Jaworski and Narver & Slater are considered pioneers. Definitions of MO developed by these and other authors are presented in Table 3.1. The common theme of these definitions is a customer focus and all definitions except the ones by Deshpandé et al. and Qiu include an action of how to respond to customer needs and wants. Furthermore, all definitions have a broader scope by not just focusing on customers but also on, for example, employees and profitability, except the definition by Ruekert. Hult (2011) built on this by centering his definition of MO (i.e., MO+) around being sustainable in different dimensions while strategically managing a broader set of issues in the market environment of the organization.

Hult and Ketchen (2017) divided these definitions into five perspectives, i.e. the decision-making perspective (Shapiro, 1988), the market intelligence perspective (Kohli and Jaworski, 1990), the culturally-based behavioral perspective (Narver and Slater, 1990), the strategic perspective (Ruekert, 1992), and the customer orientation perspective (Deshpandé et al., 1993). An alternative way of classifying these definitions is one group that views MO from an organization-behavioral perspective (e.g., Shapiro, Kohli and Jaworski, Ruekert) and one group that views MO from a cultural or employee-behavioral perspective (e.g., Narver and Slater, Deshpandé et al., Slater and Narver, 1994) (Cano et al., 2004). As such, newer studies in the MO literature are based on either of these perspectives, generally citing Kohli and Jaworski (1990) or Narver and Slater (1990), even though Deshpandé and Farley (1998) and Homburg and Pflesser (2000) developed an approach that includes both perspectives. Generally, it is argued that a firm needs to possess certain characteristics, either in behavioral terms (i.e., performing certain actions) or in cultural terms (i.e., having a certain mindset), to be considered market-oriented.

Table 3.1: Definitions of market orientation

Authors	Definition of market orientation
Kohli & Jaworski (1990, p. 6) / Jaworski & Kohli (1993, p. 54)	"... is the organization-wide responsiveness of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organization-wide responsiveness to it" → "responsiveness is being composed of two sets of activities – response design (i.e., using market intelligence to develop plans) and response implementation (i.e., executing such plans)"
Narver & Slater (1990, p. 20, 21) / Slater & Narver (1994)	1): "... the business culture that most effectively and efficiently creates the necessary behaviors for the creation of superior value for customers" → "consists of three behavioral components – customer orientation, competitor orientation, and interfunctional coordination (i.e., the coordination of the firm's resources to create value) – and two decision criteria – long-term focus and profitability" 2): "... the culture that (1) places the highest priority on the profitable creation and maintenance of superior customer value while considering the interests of other key stakeholders; and (2) provides norms for behavior regarding the organizational development of and responsiveness to market information"
Ruekert (1992, p. 228)	"The level of MO in a business unit is the degree to which the business unit (1) obtains and uses information from customers; (2) develops a strategy which will meet consumer demands; and (3) implements that strategy by being responsive to customer needs and wants"
Deshpandé et al. (1993, p. 27)	MO and customer orientation are synonymous → "... the set of beliefs that puts the customer's interest first, while not excluding those of all other stakeholders such as owners, managers, and employees, in order to develop a long-term profitable enterprise"
Day (1994, p. 49)	"MO represents superior skills in understanding and satisfying consumers"
Qiu (2008, p. 818)	"MO reflects the organizational standards and expectations for competitive intelligence generation and dissemination"
Hult (2011, p. 5)	MO+: "The concept of sustainability is increasingly being addressed theoretically by scholars and practically by managers and policymakers as it relates to being market oriented. With a growing focus on sustainability efforts, marketing is in a unique position to elevate its focus from managing relationships with customers to strategically managing a broader set of marketplace issues" → "An organization achieves market-based sustainability to the extent that it strategically aligns with the market-oriented product needs and wants of customers and the interests of multiple stakeholders concerned about social responsibility issues involving economic, environmental and social dimensions."

In the words of Hult and Ketchen (2017, p. 23): "marketing in general includes vital business activities and a strategic 'concept' of marketing embedded in most, if not all, viable revenue-generating organizations that can be capitalized on by being market oriented". As characteristics of MO are further implemented and refined over time, the MO concept can be interpreted as a range as opposed to a black-and-white issue; i.e. companies are market-oriented to a certain

degree (Grunert et al., 1996). Therefore, the idea of MO provides an assessment of the implementation of this marketing concept within an organization, and has been converted to different indicators (e.g., MARKOR, MKTOR) to be able to quantitatively measure the level of market orientation of an organization. These measurement indicators and their specifics will be discussed in more detail in Chapter 5.

Besides studying potential interpretations of the MO concept, many studies have focused on how to model this concept, or in other words what needs to be in place to be market oriented, what the consequences are, and which other variables affect the relationship between MO and its antecedents and consequences. This is summarized in Table 3.2, from which it can be seen that MO has been extensively studied, applied to and measured for individual firms and value chains in different sectors. The relationship between MO and business performance or long-term profitability is by far the most documented one and studied in different settings. However, it is subject to the measurement instrument of performance, as there are different outcomes for the MO-performance relationship when performance is measured as for example return on assets (ROA), general profits or sales volume (van Raaij, 2010).

Table 3.2: Overview of market orientation studies

Authors	Antecedents / barriers / moderating variables (MO – performance)	Mediating variables (MO – performance)	Determinants	Consequences of MO	Sectors	Unit of analysis / Setting
Avlonitis & Gounaris (1999); Jaworski & Kohli (1993); Kohli & Jaworski (1990); Kumar et al. (2011); Slater & Narver (1994)	External: competitive intensity, market dynamism, market growth, market turbulence, technological turbulence					
Bisp (1999)	Psychological factors and personality characteristics of employees and managers					
Jaworski & Kohli (1993); Kirca et al. (2005)	Internal / organizational: degree of interdepartmental connectedness, focus of top managers on MO, market-based reward systems					
Day (1994)		Market knowledge				
Maydeu-Olivares & Lado (2003); Ozkaya et al. (2015)		Innovation				
Qiu (2008)		Competitor knowledge				
Hult et al. (2008); Narver & Slater (1990)			Logistics orientation Operations orientation Supplier orientation			Supply chain

Cano et al. (2004)				Business performance	Manufacturing Service providers	Profit and non-profit organizations
Deshpandé & Farley (2004); Ellis (2005)				Business performance		Developed and developing economies
Ellis (2006); Jaworski & Kohli (1993); Matsuno & Mentzer (2000); Narver & Slater (1990); Ruekert (1992); Slater & Narver (1994, 2000)				Positive effect on business performance and profitability		
Kumar et al. (2011)				Business performance		Short and long run
Langerak (2003); Nicovich et al. (2007)				Business performance: non-significant relationship		
Trondsen & Johnston (1998)				Business performance	Natural resource-based	
Doyle & Armenakyan (2014); Liao et al. (2011)				Competition, innovation, learning, marketing		
van Raaij & Stoelhorst (2008)				Positive effects for customers and employees		

Other variables that affect the relationship between MO and performance can be categorized as either moderating or mediating variables. Examples of moderating variables that occur in the environment of an organization and strengthen the need for a MO include market turbulence, technological turbulence, competitive intensity and market growth. These moderating variables increase the need for information processing (Turner et al., 2012) and thus the need for making use of market intelligence and being market-oriented. However, Kirca et al. (2005) found insignificant results for these moderating variables to affect the MO–performance relationship. Furthermore, besides encouraging to adopt a MO, these variables could also act as barriers to adopt MO practices, just like psychological factors and personality characteristics of employees and managers.

Examples of mediating variables that enhance the effect of having a MO on performance include learning and innovation. In the case of learning, it is generally argued that having a knowledge advantage about the market the firm operates in or the firm's competitors besides being market oriented in itself improves economic performance. In the case of innovation, the argument is that being market oriented implies having a knowledge advantage that is beneficial to new product development, although mixed effects have been found here as well (e.g., Han et al., 1998; Vazquez et al., 2001). In addition, Wang et al. (2009) found that MO acts as a mediating variable between knowledge management and performance.

A different focus is the implementation side of MO, and thereby the question of how to actually become market oriented or (further) increase the level of MO of an organization or company. Different approaches to implementing a MO have been established based on the different definitions and understandings that have been developed (van Raaij and Stoelhorst, 2008). Common approaches of implementing a MO include changing the organizational system within which is operated; changing the norms, beliefs and values of an organization; or a combination of these two perspectives. Van Raaij (2010) listed ten implementation approaches, for which it is generally thought that a MO could be started by ensuring that the internal or organizational antecedents are in place, whether those are defined as top-down management approaches, the establishment of certain strategies, or having certain norms and standards among employees.

To summarize all of the above, market-oriented organizations are well-informed about the market they are operating in and use that information advantage to create superior customer value (van Raaij, 2010). There are two perspectives that newer studies in the MO literature are generally based on; the employee-behavioral perspective by Narver and Slater and the organizational-

behavioral perspective by Kohli and Jaworski. Narver and Slater argue that to create superior customer value, a firm and its employees should be aware of expressed and latent needs of its customers through a customer orientation, as well as the activities of other firms in the same market through a competitor orientation. Information obtained from these two sources is being distributed throughout the firm and among its employees by interfunctional coordination. Kohli and Jaworski on the other hand, argue that superior customer value is created by focusing on and gathering information on the broader environment and stakeholders that form consumers' current and future needs, such as technology and regulations, disseminate this information throughout the organization and respond to it accordingly. These authors later argue that being able to anticipate and look ahead on this environment of consumers' needs, i.e. market or industry foresight, is an important part of being market oriented and could lead to long-term success as opposed to more short-term positive performance. The authors further argue that the term customer orientation as used by Narver and Slater indicates a narrower focus, and Ketchen et al. (2007) further stated that being market oriented has increases the likelihood to satisfy both current and future consumer needs while being customer oriented increases the likelihood to satisfy current consumer needs only. As such, the term market orientation is a better fit to this discussion (Jaworski and Kohli, 1996).

MO has recently been studied beyond individual firms as superior customer value is created using integrated vertical networks, supply and value chains, and the resulted information exchange within these channels. Therefore, it can be argued that the level of MO of one firm in a value chain affects the MO level and performance of another firm in the value chain (e.g., Siguaw et al., 1998; Langerak, 2001), but also of the overall value chain (Grunert et al., 2002; Grzeskowiak et al., 2007). From a conceptual perspective, MO at the supply chain level is studied by, amongst others, Min et al. (2007) and Hult et al. (2008). Min and colleagues differentiate between the concepts supply chain orientation and supply chain management, in which supply chain orientation considers the supply chain as an integrated entity from within a firm while supply chain management views it as an entity across firms or from within the chain. As such, they state that MO is an antecedent to supply chain orientation, which in turn affects supply chain management and individual firm performance. The authors, following Kohli and Jaworski, view MO as three components, i.e. intelligence generation, intelligence dissemination and intelligence responsiveness. They also model, besides an indirect effect, a possible direct effect of MO on firm performance. In addition to the determinants of MO at the individual firm level, determinants of MO at the supply chain level include, amongst others, supplier orientation, logistics orientation,

and operations orientation. To illustrate how MO relates to other variables as discussed above a visual model is shown in Figure 3.1, from which it can be seen that MO is integrated with the other variables that in turn together affect firm performance.
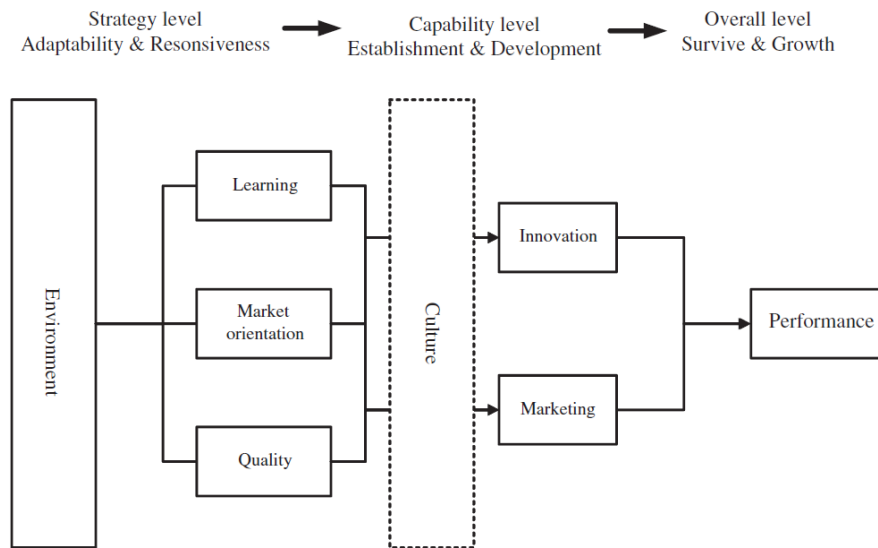
Source: Liao et al. (2011)

Figure 3.1: Visual representation of market orientation-related concepts

3.2   Market orientation in agriculture

The concept of market orientation (MO) has been widely studied in different settings and sectors from a more empirical perspective rather than conceptually as described in the previous section. One of those fields in which MO has been applied is agricultural and food economics, both in a producer or firm context and value chain context.

At the firm level, some studies have focused on testing the MO concept for food companies further down the value chain, such as retailers and food processors, while others have focused on testing this for individual producers. Insch (2010), for example, found that innovative value-added solutions, consumer understanding, leading or driving the market, and chain coordination are all aspects of market-oriented behaviors that make use of market intelligence for Australian meat retailers. However, mixed results were found when innovation was included as a mediating variable between performance and the interfunctional coordination part of MO (e.g., Johnson et al., 2009). Grunert (2006b) argued that in order to be market-oriented, food producers and

processors need to have certain market-related competencies, of which the most important are understanding consumers, being able to develop new products, and managing relationships.

Micheels and Gow have extensively studied and tested the idea of MO for agricultural producers, with beef producers in particular. Micheels (2010) assessed the level of MO, innovation, entrepreneurship and organizational learning of beef producers in Illinois, and the effects on their business performance. His results show that being market oriented is important as it has the greatest effect on firm performance, compared to the other concepts. The beef producers in this study obtained their level of MO by making a better use of market signals other than price signals, instead of focusing on production efficiency. Micheels and Gow (2009) argue that it is important for an agricultural producer to have clarity on which strategy or value discipline to follow (e.g., product leadership, customer intimacy, operational excellence (Narver and Slater, 1990)) in order to focus on specific attributes that are valued by customers and that agricultural producers can provide based on existing competencies, skills and resources. The authors found that organizational learning, innovativeness and high MO levels cause value discipline clarity, while a medium level of MO does not cause clarity of which strategy to follow. Micheels and Gow (2011a) further show that there is no strong relationship between a firm's strategy and its level of MO, although the MO level is the highest for those beef producers who have customer intimacy as part of their hybrid strategy as opposed to operational excellence. The results of this study and a later study (Micheels and Gow, 2011b) also indicate that performance is better for producers with a higher level of market orientation.

Other studies that assessed the level of MO for agricultural producers are those by e.g. Mirzaei et al. (2016) and Ma (2016). Mirzaei et al. (2016) found that farms in Ontario that have an entrepreneurial and market orientation are more likely to adopt new products, while environmental turbulence was found to be an antecedent for the level of MO. Ma (2016) assessed MO for beef producers in Western Canada and concluded that both MO and organizational performance positively affect beef production efficiency and performance, and that this relationship is enhanced by the use of management tools like benchmarking and record keeping.

The MO concept has also been studied for vertical networks and inter-firm relationships in food and agriculture, as well as agri-food value chains. Elg (2003), for example, found that inter-firm MO is an important variable for food retailers, as they are highly dependent on other actors in the value chain. Relational characteristics such as trust and cooperation were found to be important

antecedents to being market oriented. Grzeskowiak et al. (2007) further found that there is a stronger need for MO behaviors in upstream actors if market uncertainty is higher, but when upstream actors are more market-oriented this does not necessarily lead to better performance of the vertical network. Finally, these authors found that consistent MO behaviors within the vertical network is key to achieving high overall network performance.

Grunert et al. (2002; 2005) have been instrumental in developing the MO concept for agri-food value chains, based on the conceptualization by Kohli and Jaworski (1990). Grunert et al. defined MO for agri-food value chains as a set of organizational behaviors and processes that include the three market intelligence concepts. They argued that these three activities might not be evenly distributed throughout an agri-food value chain, since generally market intelligence generation occurs more downstream while responsiveness generally occurs more upstream a value chain. Initial determinants of the degree of MO for agri-food value chains include heterogeneity of consumer demands, characteristics of relations between value chain members, and the regulatory environment, along with firm-specific structural and attitudinal factors (Grunert et al., 2002). This list was later extended by barriers of exploitation of opportunities, characteristics of the market supply, competitive pressure, mental models and market-oriented trade associations as determinants (Grunert et al., 2005). Both models will be discussed in more detail in the next chapter.

Other studies that have tested the MO concept for agri-food value chains include, amongst others, those by Bröring (2010), Kottila and Rönni (2010) and Ho et al. (2017). Bröring (2010) looked at MO from an input supplier perspective and concluded that the degree of integration of agri-food value chains matters for adopting MO, as that improves the information flow. Kottila and Rönni (2010) also studied the communication and information flows of an agri-food value chain as part of MO and found that agri-food value chains sometimes appear to be disaggregated and disconnected when communication only takes place between two adjacent actors. Grunert et al. (2010) explored the role of mental models of key decision-makers in international agri-food value chains, as a mediator between external market factors and the level of MO of the respective value chain. The authors found that mental models of decision-makers facilitate MO behaviors when the agri-food value chain operates in a more homogeneous market, but not when it operates in a more heterogeneous market as actors within the agri-food value chain already make use of market intelligence in that case. Ho et al. (2017) assessed the level of MO for a beef value chain but found no significant relationship between MO and financial performance of the beef value chain.

However, customer orientation and interfunctional coordination did increase innovation and innovation in turn had a positive effect on chain financial performance.

Sections 3.1 and 3.2 hinted that determinants such as mental models or attitudinal factors, environmental turbulence (e.g., regulatory environment, competitive intensity, market uncertainty), heterogeneity of consumer demands, firm-specific factors, and other market-oriented relationships seem to play an important role in modeling MO at the value chain level, both within agriculture and other sectors. As such, these determinants will be further explored in Chapter 4 to examine whether they are also of value when modeling MO for the beef industries in Canada and Ireland.

3.3   Producer decision-making

Market orientation does not only involve having a good understanding of the market, but also requires the necessary skill set to use that understanding to respond to external market factors and practice innovation and increase competitiveness (Grunert et al., 1996), both as an individual firm as well as a value chain or entire industry. With farmers being the backbone of agricultural industries, their decision-making processes are critical to responding to market intelligence. As such, their grassroots use of market intelligence could influence the competitiveness of the overall industry when facing uncertainty and challenges (Garforth et al., 2004; Feola et al., 2015).

Returning to the field of neoclassical economics, it is assumed that homogeneous products are produced by single competitive firms, who thereby face equal costs and market demands. Production of goods follows either the strategy of cost minimization or profit maximization, whereby resources such as capital and labor are allocated to produce the output with the lowest costs or the greatest profit possible. These strategies have long been the default approaches of studying production decisions of agricultural businesses. However, decision-making processes of farmers are considered more complex (Edwards-Jones, 2006) than those of managers in other sectors due to the dependability on biological processes and natural resources like water, land, crops and livestock. These resources will in turn affect farmers' behaviors and decisions in a different way than when economic incentives (i.e., profit maximization, cost minimization) are the major drivers of decision-making processes, as farmers pursue other objectives in addition to maximizing income, such as ensuring a certain lifestyle (Vanclay, 2004) or being independent. As such, farmers maximize utility from both maximizing profits as well as non-profit activities like pursuing a particular lifestyle. Therefore, it is acknowledged that farmer decision-making is

nested in agricultural systems (Vanclay, 2004; Edwards-Jones, 2006), both biophysically and socially. Production decisions to maximize profits and utility are then influenced by these biophysical and social factors. Depending on the context of a specific decision, social factors might play a bigger role than biophysical factors (Feola et al., 2015).

Like in other sectors, agricultural businesses need to coordinate their production factors land, labor and capital in order to create value or competitive advantage (Narver and Slater, 1990). Following the resource-based theory (Barney, 1991, p. 101; cf. Ketchen et al., 2007), resources are "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm". Resources can be categorized as physical capital resources such as equipment, land, and financial resources; human capital resources such as training, experience, intelligence and insights of managers and employees; and organizational resources such as the firm's structure, its culture and relationships within and beyond the organization. The human capital resource in terms of the decisions on how to use inputs and the implementation of plans and strategies (i.e., farm management) is increasingly getting attention as an additional production factor and is assumed to positively affect the performance of the organization (Nuthall, 2010).

This human capital resource or farmer decision-making is generally affected by several intrinsic and extrinsic factors, including agronomic, cultural, social, psychological and economic factors (Burton, 2004; Edwards-Jones, 2006). As such, a successful farm manager's skills and knowledge cover a wide range of areas ranging from understanding technologies and the factors behind it (e.g., sowing rates, fertilizer application), observation and recording (e.g., animal performance, state of international markets), planning (e.g., risk management, job priorities), anticipation, people skills (e.g., maintaining relationships on and beyond the farm), and personality management (e.g., objectives, stress management). Studies incorporating the socio-economic or psychological side of managing agricultural businesses are often based on the Theory of Reasoned Action and the Theory of Planned Behavior, which essentially state that attitudes and subjective or societal norms (i.e., what is expected by others, including other farmers) (Burton, 2004; Garforth et al., 2004; Edwards-Jones, 2006). As such, farmer decision-making is influenced by the level of managerial and entrepreneurial skill, as well as other intrinsic factors such as values, motivations, management style (e.g., Fountas et al., 2006), personality, the willingness and opportunities available to learn and expand knowledge and skills, and the belief of how much control one has about the destiny of the farm as opposed to weather, markets and governments

(i.e., locus of control) (Nuthall, 2010). Indeed, attitudes have been proven to affect farmer decision-making (Edwards-Jones, 2006; Kim and Cameron, 2013), for example towards the ethical approach of farming or to legislation or broader developments in the sector. These attitudes, or in other words psychometric characteristics, defined as the deeply ingrained assumptions and generalizations about the world in general play a significant role in how people respond to a problem or issue (Jaworski and Kohli, 1996) and therefore affect an individual's decision-making style.

Farm and farmer characteristics such as age, education, farm type, farm size of farm income level have also been found to affect farmer decision-making (Edwards-Jones, 2006; Kim and Cameron, 2013). With respect to age and education, Solano et al. (2006) found that age negatively affects the number of different management practices performed (e.g., pasture management, animal management, financial measures), while education positively affects this. Furthermore, Wilson (2014) concluded that having agricultural qualifications or higher education improves farm business performance. Characteristics of the farm household also affect farmer decision-making, such as the number and age of children and the involvement in off-farm employment (Edwards-Jones, 2006).

Extrinsic factors that affect farmer decision-making processes include economic, environmental and social factors. Examples of social factors are, besides the societal norms described above, the role of extension specialists, local and national authorities, other agribusinesses, and other social networks (Feola et al., 2015). Broader economic and environmental factors may indirectly affect farmer decision-making as they seem to be out of the control of individual farmers, but the perception of the capacity to influence these broader factors is known to be an important factor of social action (Ajzen, 2002; cf. locus of control). Feola et al. (2015) found that farmers take these broader economic, environmental and social factors and challenges into account in their decision-making, but only responded to the most pressing one and hoped that that response made them resilient to other sources of risk.

Even though farmers rely on their experience for many of their decisions, they are also known to put much effort in gathering information to further inform their decision-making process, making information, like human capital, another production factor that is getting increased attention (Just et al., 2002). According to neoclassical production theory, heterogeneous agents use different input mixes, such that different decision-makers will use different amounts of different types of information, to both substitute and complement the in-house informational resources or

production factors (Just et al., 2002; 2003). In fact, information and human capital are closely related as an agent's information processing capabilities (i.e., human capital) shape the demand for and the ability to make use of externally sourced information sources (Just et al., 2003). Farmers need to gather information or intelligence on the external market factors that affect farmers' immediate business environment, in particular when coping with uncertainties. As such, farmers' decision-making processes are also affected by their informational needs and the information sources they consult, both in ordinary and uncertain times.

Farmers' informational needs include, amongst others, price information, supply and demand estimates, information about new or alternative technologies, information related to regulation and trade policies, and information about broader societal factors such as general social trends, emerging lifestyles and consumption patterns. Typical information sources for farmers are commodity or producer associations, consultants, neighbours and other community members, extension services, and other fee-based or subscription services. Just et al. (2002) noted that farmers often receive their information through social and professional networks or as a byproduct of an economic transaction.

Information sources can be classified in multiple ways, for example personal and impersonal, as well as per channel (e.g., documents, media, extension services) and frequency of use. Farmers tend to rely on intuition or experience due to the complexity of their businesses and potential mix of objectives, as well as their unique familiarity with the cultural and location-specific aspects of their operation. Farmer characteristics like age and education and farm attributes such as area and herd size influence the demand for other information sources (Solano et al., 2003), where education is positively correlated with the use of data, public sources and formal formats of information (Just et al., 2002; 2003). In other words, farmers with lower levels of human capital use more processed information from informal sources (Just et al., 2002).

Scholars like Babcock et al. (1990), Lusk (2007) and Thompson et al. (2014) studied the value of one particular type of information to farmers' decision-making processes (see Section 3.1), while authors like Just et al. (2003), Kapoor and Kumar (2015) and Gillespie et al. (2016) assessed the use of information sources for specific decision-making situations. Just et al. (2003) found that farmers make significant use of informal information sources for all decision-making situations. For yield and production risk information, farmers relied on farm print media, informal communications and extension services to a lesser extent, while farmers used subscription services and government sources for market and price risk information. These same farmers

relied on producer groups and government sources for institutional information. Kapoor and Kumar (2015) also found that personal sources played a more important role than impersonal sources (e.g., farm print media, advertisements) when informing buying decisions. Peers, family and friends were considered the most preferred source of information due to reliability and accessibility, followed by salespersons. The authors further note that the number of information sources consulted increased for inputs purchased less frequently, and that land size positively affected the number of information sources consulted for frequently purchased inputs. Finally, the average number of information sources used was between two and three for frequently purchased inputs. However, the number of information sources used in any given situation again depends on the personality of the farmer, as some will be comfortable consulting a few information sources where others prefer to consult a larger number before coming to a decision. With respect to the marketing decisions of beef producers, Gillespie et al. (2016) noted that US grass-fed beef producers used an average of 1.5 information sources. The most frequent used source was the Internet, followed by other farmers, and other sources such as farmers' markets. The least frequent used source was extension services, followed by farm organizations, and media.

Furthermore, different information sources are perceived differently by individual farmers, both in terms of credibility and perceived influence (Garforth et al., 2004). For example, Alarcon et al. (2014) found that veterinarians were the most trusted information source among pig farmers in times of disease, while other important information sources included other producers and experiences from abroad. The pig farmers in this study had negative attitudes towards research outputs as a trusted information source, particularly due to perceived lack of communication and an information bias. Magne et al. (2010) further found that in order for an information source to be a useful resource for a farmer, farmers consider its medium (e.g., paper-based or computer-based), its origin (e.g., the farmer's memory, experience, other farmers and organizations) and its content relevance to certain domains of the farm (e.g., breeding, pasture management, marketing, finances). The authors further noted that farmers tend to use information sources from multiple mediums and origins to validate its contents and justify their ultimate decision, and use a different combination of information sources depending on the situation of decision-making. The findings by Just et al. (2003) add that timeliness is the most valued aspect of all information sources. The farmers in their study agreed that public information is valued for its accuracy and lack of bias while private information is valued for its timeliness and accuracy, and that informal information is valued for its timeliness, accessibility and geographic specificity. Finally, Just et al. (2002; 2003) also found that the use of information sources depends on what sector the farmer is

operating in. The authors noted that when a sector is more commodity-oriented (e.g., wheat, hogs), farmers in these sectors seem to rely relatively more on formal, public and impersonal information sources.

3.4　Contributions

The above-mentioned studies show that market orientation involves a certain business approach or philosophy focused on getting a superior understanding of expressed and latent preferences of both existing and potential immediate customers or end consumers. In order to get this superior understanding, market intelligence regarding these and other stakeholders in an organization or value chain's market, as well as its broader environment, is being used. As such, common antecedents, which could also function as barriers, of MO include technological turbulence and competitive intensity, while variables reinforcing MO effect are learning and innovation. Furthermore, these studies also showed that the level of MO depends on so-called mental models, or the perceptions of key decision-makers within an organization or value chain. The most common and most studied consequence of MO is performance, where the focus is not only on short-term profit but also on longer term, sustainable profit (Narver et al., 2004). In an agricultural setting, understanding consumers as well as managing relationships have been found important parts of MO. Environmental turbulence and market uncertainty were identified as antecedents of MO, as well as the degree of integration of connectedness of a value chain. Again, mental models, especially in dealing with homogeneous goods, were found to be of influence on the level of MO, as well as taking into account the producer's competencies, skills and resources in order to create superior customer value.

Concluding, the MO concept has been widely studied in high-income countries and large company settings, and to a limited extent for small and medium-sized enterprises (SMEs) and developing countries. MO has been found to positively affect business performance in these high-income countries (e.g., Cano et al., 2004; Ellis, 2006) and sustainable competitive advantage of mature economies (Ellis, 2005). In other words, the arguments of the MO theory and practice have been assumed to be constant and equally applicable in other environmental conditions (Narver and Slater, 1990). However, the studies above also showed different or non-significant results, as well as the use of different definitions (i.e., a set of skills vs. a set of activities), conceptualizations and measurements (see Chapter 5) of MO. It is therefore complicated to draw clear conclusions from the literature about how to conceptualize MO, what the consequences are, and what in turn can be done to improve the level of MO (van Raaij and Stoelhorst, 2008). This is especially true when

the concept is being applied to a new context, as with the industry level in agriculture. Therefore, there is a need to discover whether the arguments of the MO theory can be applied in different environmental conditions. While MO potentially has general relevance regardless of the empirical setting, the specific context should be taken into account and adapted to the MO approach (Elg, 2007), and so specific MO practices at the agricultural industry level need to be understood before a proper implementation of this concept is possible. In addition, understanding the unique setting of agricultural industries may give rise to developing new perspectives and practices in the marketing discipline than what has previously been discovered in the literature. Therefore, this thesis aims to contribute to the MO literature by exploring how MO practices are perceived at the agricultural industry level. Furthermore, it is unknown how different production systems in the same sectors resemble regarding the level of MO. As such, a second contribution of this thesis is to compare two entities of the same sector and provide an overview of differences and similarities in their MO approaches, thereby taking their specific contexts into account.

With regard to MO applied to an agricultural setting, the studies mentioned above mainly discussed determinants and consequences of MO at the producer or firm level and value chain level. However, it is unknown how MO can be conceptualized at a greater level, i.e. the agricultural industry level. As such, a third contribution of this thesis is to investigate how the level of MO of an agricultural industry can be modeled and quantified, whereby the industry is the smallest unit of analysis, as opposed to individual firms or value chains. In addition, most of the studies mentioned in Section 3.2 were based on the interpretation of MO by Narver and Slater (i.e., using the concepts customer orientation, competitor orientation, and interfunctional coordination). However, as will be discussed in more detail in the next chapter, the broader environment of technology and regulations in which agricultural industries operate in is an important factor to be considered. Combined with the facts that a collaborative approach is key to responding to consumer needs and preferences (Kottila and Rönni, 2010) and other external market factors and farmer decision-making is socially embedded, the approach by Kohli and Jaworski (1990) incorporating the market intelligence concepts (i.e., intelligence generation, intelligence dissemination, and intelligence responsiveness) seems a better approach for analyzing the level of MO of agricultural industries. Therefore, a fourth contribution of this thesis is to extend the analysis of agri-food value chains initiated by Grunert et al. (2002; 2005) to the industry level, and thereby making use of the intelligence concepts developed by Kohli and Jaworski (1990).

The section on producer decision-making showed that many different factors, including economic and psychological factors and the perception and relevance of information sources, affect farmer decision-making, both in regular situations as well as when responding to market challenges. However, due to the heterogeneity of farmers' goals, resources, environment, perceptions, attitudes to risk and uncertainty, and the many different decisions to be made on agricultural operations, it is complicated to identify the most important factors for every situation (Kim and Cameron, 2013). Therefore, a fifth contribution of this thesis is to investigate which factors and use of information sources influence farmer decision-making, thereby taking the specific context, different decision situations and time horizons into account.

Chapter 4: Conceptual model

In this chapter, a conceptual model based on the literature of market orientation in general and applied to agriculture, and producer decision-making literature as discussed in Chapter 3 is developed to map out the factors affecting the MO level for beef industries in Canada and Ireland and the agricultural industry level in general. In Section 4.1 existing conceptual models for agri-food value chains are discussed, after which an adapted version for the industry level is presented in Section 4.2. Finally, the contributions of this new model to the academic literature and hypotheses to be tested in the empirical part of this thesis are discussed in Section 4.3. This chapter aims to provide a partial answer to the second, third and fourth research question, i.e. "How can the concept of MO in an agricultural setting at industry level be modeled and quantified?", "What are determinants of MO in the Canadian and Irish beef industries?", and "What are determinants of producer decision-making processes?".

4.1   Existing conceptual models

As mentioned in the previous chapter, conceptual models that represent the MO level for agri-food value chains were developed by Grunert et al. (2002; 2005). Both models are based on the definition by Kohli and Jaworski (1990)[17], using the three market intelligence concepts intelligence generation (IG), intelligence dissemination (ID), and intelligence responsiveness (IR).

Grunert et al. developed an initial conceptual model in 2002, which is shown in Figure 4.1 and includes the determinants end-user heterogeneity, raw material heterogeneity, relational characteristics between different actors in a supply chain, regulations, and firm-specific factors to influence the level of MO of agri-food value chains. The authors argued that, from a transaction cost economics approach, heterogeneity or dynamism of end users served leads to uncertainty and therefore requires transaction-specific investments, such that transaction costs increase. MO, i.e. knowledge of those end users, could reduce uncertainty and thus decrease transaction costs or increase the return on those transaction-specific investments. It is argued that this type of heterogeneity can be dealt with in all stages of a value chain, although it is more likely that parties further downstream face this heterogeneity more often.

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[17] "Market orientation is the organization-wide responsiveness of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organization-wide responsiveness to it" (Kohli and Jaworski, 1990, p. 6)

Regulation

End-user heterogeneity and dynamism

Raw material homogeneity and dynamism

Market orientation of value chain

Hold-up problems

Perception of opportunities

Firm-specific structural factors

Firm-specific attitudinal factors

Relational characteristics:
- Trust and commitment
- Segregation and traceability
- Information exchange
- Power dependence
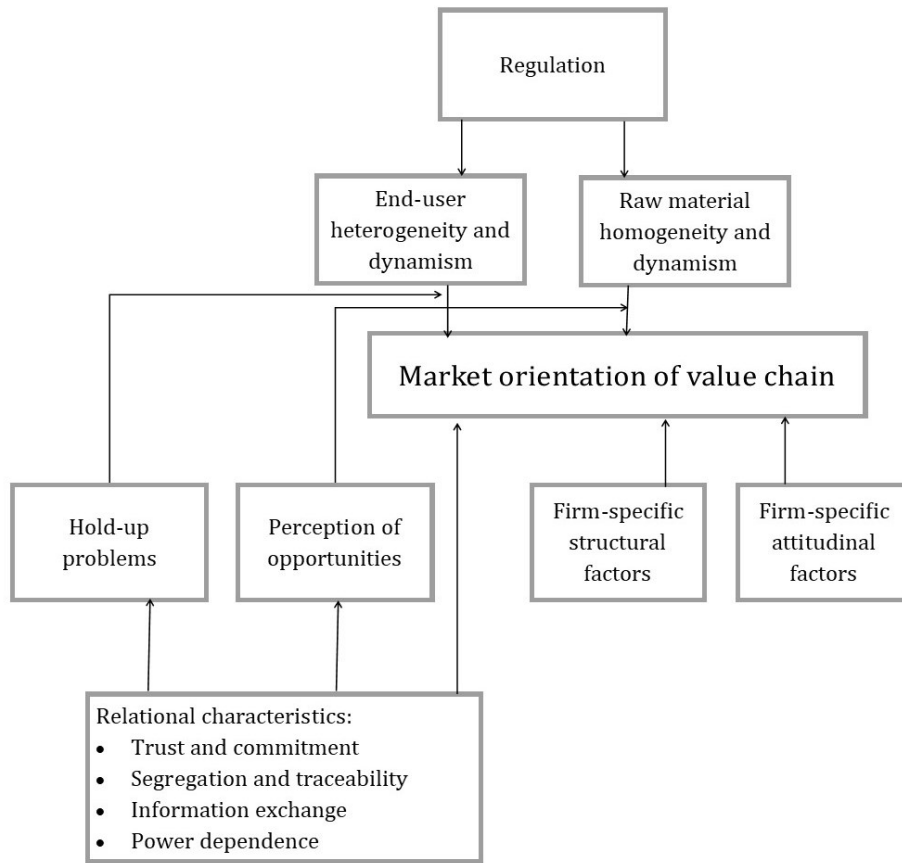
Source: Grunert et al. (2002)

Figure 4.1: Market orientation determinants of agri-food value chains – "2002" conceptual model

The second type of heterogeneity, raw material heterogeneity or degree of homogeneity of raw materials as represented above, is argued to play an important role in natural resource industries, e.g. agriculture and fisheries, as these production processes are subject to natural biological variation and seasonal supply (Trondsen and Johnston, 1998). Exploiting this heterogeneity could also lead to increased transaction costs due to additional investments, although doing this is commonly seen as part of being market oriented (Grunert et al., 2002).

Grunert et al. further argue that these two types of heterogeneity can be used to hypothesize the degree of MO of a value chain and where in the value chain the activities related to MO are situated. For example, if there is both a high degree of heterogeneity of end-users served and a high degree of heterogeneity of raw materials, a high level of market orientation is expected since two types of heterogeneity have to be considered and fulfilled. This in turn causes intelligence

generation and responsiveness activities to be rather evenly distributed throughout a value chain. The authors further note that a realization of MO of a value chain is conditional on the perceptions of the key decision-makers within this value chain regarding opportunities to exploit these heterogeneities, i.e. firm-specific attitudinal factors.

These two forms of heterogeneity are indirectly affected by another major determinant of MO of a value chain, i.e. characteristics of relations between members of the value chain. The characteristics in Grunert et al. (2002)'s model include trust, commitment, segregation, information exchange and power. They argue that absence of trust and commitment can give rise to hold-up problems, where a hold-up problem could be described as if prior to a transaction the gains from trade can be increased by making transaction-specific investments. As such, if one actor within the value chain chooses to avoid transaction-specific investments to decrease his vulnerability, a hold-up problem will in turn affect the ability of exploiting the heterogeneity of end-users served and therefore lower the MO level.

Grunert et al. further reason that relations open to segregation based on quality differentiation are one requirement for product differentiation and to be able to meet heterogeneous end-users' demands and increase the MO level. In addition, a high level of information exchange is said to lead to a high degree of MO due to intense monitoring and adaptation. It is also argued that both power symmetries and asymmetries can indirectly lead to a higher MO level, as long as the powerful actors in a value chain are market-oriented and non-opportunistic. As a result, raw material heterogeneity can be exploited in a profitable way for the entire value chain as opposed to benefiting only one actor. However, the authors also point out that a too close connection between members of the value chain, i.e. vertical integration, can lower the degree of MO, and as such that value chains with a lower level of information exchange are still able to have a higher MO level.

The regulatory environment of a value chain is also said to have an indirect effect on a value chain's MO via both the two types of heterogeneity discussed above and the relational characteristics between different value chain members. For example, regulations in place could stimulate competitiveness in a given market and so prohibit integration or coordination mechanisms in the value chain. Finally, the MO level of a value chain could be affected by structural firm-specific factors such as size, location, (financial) resources, and skills of individual employees like education, experience and social relations.

An alternative conceptual model was developed later in 2005 by the same authors, who adapted the above discussed model based on four case studies in the food industry. This model is presented in Figure 4.2, and includes the determinants competitive pressure, heterogeneity of end-users served, regulations, mental models, market oriented trade associations, trust and commitment in relations, and short and balanced chains.
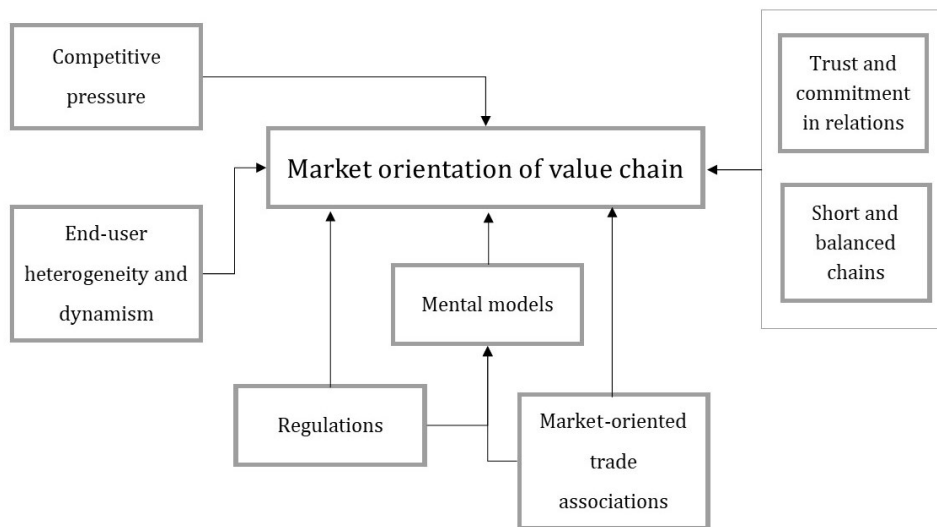
Source: Grunert et al. (2005)

Figure 4.2: Market orientation determinants of agri-food value chains – "2005" conceptual model

In contrast to the 2002 model, end-user heterogeneity is an important determinant but is not connected to uncertainty or other barriers to exploitation of heterogeneity. However, the authors do mention another barrier to exploitation, i.e. mental models, which means that certain opportunities are not perceived, not considered profitable or are subject to hold-up problems. As such, perceptions of key decision-makers within a value chain can negatively affect the MO level of that value chain. These perceptions are in turn determined by market-oriented trade associations, which can influence the mindset of actors in a value chain as they often have chain-wide relationships. The authors further state that competitive pressure, i.e. the degree of competition in a given industry, positively influences the MO level of a value chain, as the products brought forward by such a value chain have to be adapted more often to satisfy current and future demands.

Rather similar to the 2002 model, in this model trust and commitment, as well as short and balanced chains are modeled as characteristics of relations between value chain members. The authors argue that trust and commitment facilitate information exchange and dissemination of end-user demands, which in turn increase the MO level. The MO level is also increased when a chain is relatively short and thus easy to oversee and manage, and when power is equally spread throughout the chain.

4.2 Modified conceptual model

As the previous discussed conceptual models by Grunert et al. (2002; 2005) were developed for agri-food value chains but not for a broader environment of agricultural industries, this section presents a modified conceptual model applied to the Canadian and Irish beef industries and discusses the included determinants in more detail.

The two conceptual models by Grunert et al. are tailored to the food industry and are therefore an excellent starting point to study the MO level of beef industries in Canada and Ireland. Both models include rather similar categories of determinants (e.g., relational characteristics between actors of the value chain, barriers to exploit heterogeneity), as well as offer different determinants to be of use for beef industries. Determinants from the 2002 model that could be of use to model MO for the beef industries in Canada and Ireland include heterogeneity of end-users served, raw material heterogeneity, regulations, and relational characteristics (see subsections below). The 2005 model is based on four case studies of the food industry other than the beef industry, resulting in that some determinants might not be applicable to studying the MO level for beef industries. For example, beef industries are not necessarily short but involve several actors ranging from breeding through finishing cattle through processing and retailing. Other drawbacks of this model are the absence of raw material heterogeneity and the market intelligence concepts, as argued for in the 2002 model.

The most important issue with these two models is that, although they are both built on the MO concept as explained by, amongst others, Kohli and Jaworski (1990), they do not take into account the refinements of this concept, i.e. the three market intelligence elements. Therefore, an attempt is made to combine the two conceptual models of Grunert et al. to design a model applicable to the industry level as opposed to the value chain level. In doing that, some of the determinants by Grunert et al. are incorporated, other determinants that are thought to be specifically relevant to the Canadian and Irish beef industries are added, and the model is further refined by taking into

account the three market intelligence concepts, as well as the interplay between decision-making processes at the farm and industry level. This modified conceptual model is presented in Figure 4.3.

Compared to the models developed by Grunert et al., the structure of this modified model has changed significantly. Whereas the determinants in the value chain models by Grunert et al. were evolving around its central theme of MO, this industry model is structured using several layers to accommodate the incorporation of the three market intelligence concepts as part of the overall MO. The determinants relevant to the beef industries in Canada and Ireland are connected to one or more of the market intelligence concepts as is shown by the different colors and shape styles of the boxes in Figure 4.3.

4.2.1 Intelligence generation

Intelligence generation (IG) is defined as the sum of activities by all industry members regarding acquiring knowledge about a broader set of (external) market factors and stakeholders. This includes end consumers and their needs and preferences (Kohli and Jaworski, 1990), as well as factors that shape these needs and preferences and that determine perceived consumer value and costs (Grunert et al., 1996). Therefore, having market and industry foresight on factors such as technology, regulations, lifestyles, latent consumer needs, but also core competencies is an important part of being market oriented (Jaworski and Kohli, 1996). For the Canadian and Irish beef industry, three external market factors are thought to be of influence on the MO level, i.e. end-user heterogeneity, raw material heterogeneity, and regulations and trade agreements. IG in the case of the Canadian and Irish beef industries can be performed by multiple industry actors, as it consists of, for example, carrying out market research as well as presenting unperceived needs to potential consumers by developing new beef products.
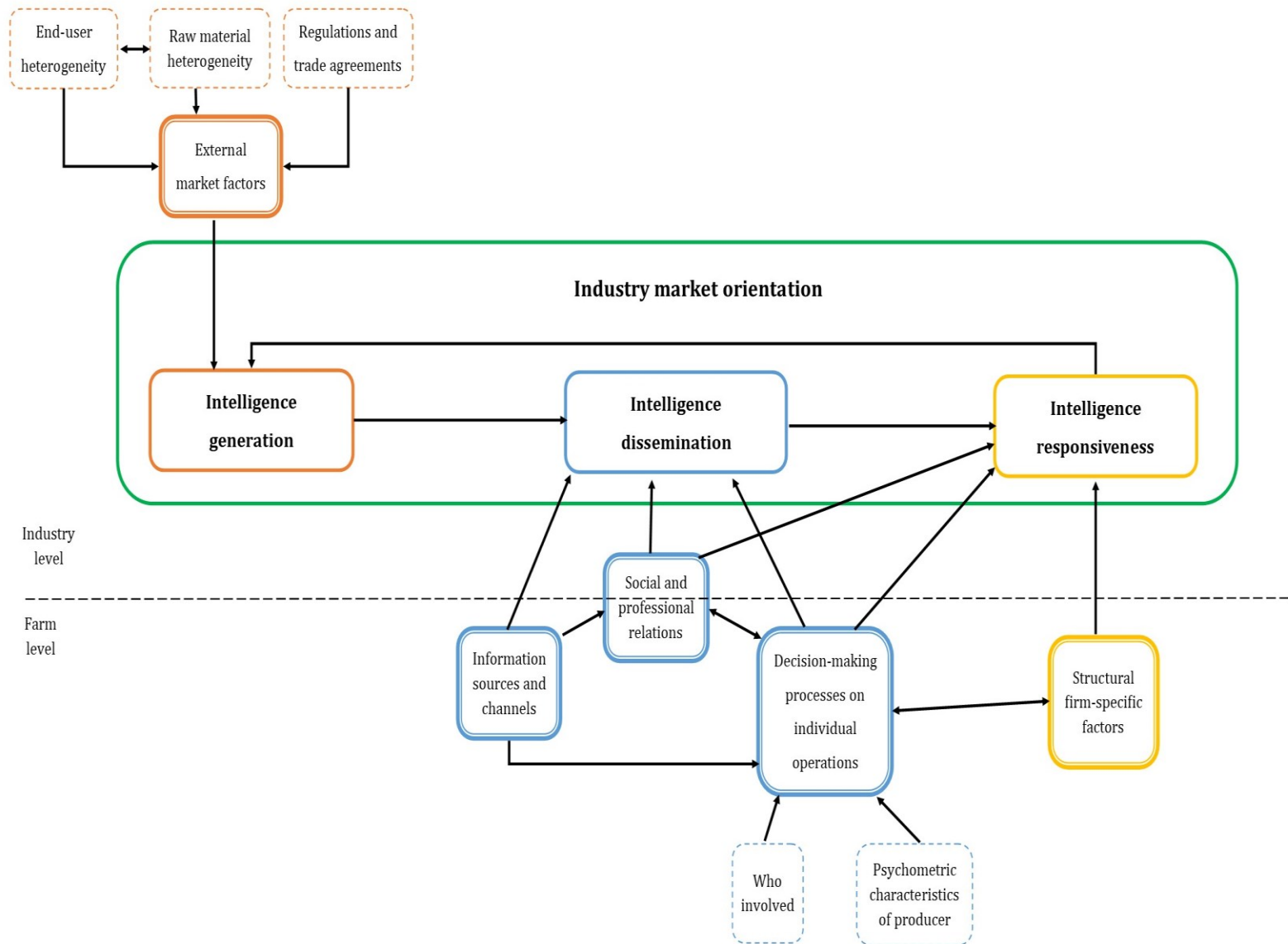
Figure 4.3: Modified conceptual model

Heterogeneity of end users served is important for the Canadian and Irish beef industries, as contemporary consumers demand a range of quality attributes in beef products, which are influenced by social movements. Examples of trends related to beef consumption include demand for certain production specifications like hormone-free, organic, animal welfare friendly, and grass- and/or pasture-fed. Consumers might also have preferences for certain cuts and perceived (eating) quality of beef products in terms of sensory attributes (e.g., tenderness), health and convenience. A high level of awareness of these factors enables the beef industry to focus on those aspects of beef products that are valued by consumers. The market or industry foresight part of IG for Canadian and Irish beef industries also involves gathering information about competitors, in terms of other beef producing countries that might export their products to the Canadian or Irish market and domestic meat producing sectors (e.g., pork, poultry) as consumers might substitute those meat products for Canadian or Irish beef consumption. Other factors that can affect production, consumption and export capacity of beef industries are macroeconomic factors like exchange rates and inflation rates.

Likewise, due to variability in e.g. climatic conditions, diets, cattle breeds, animal management systems and age of slaughter (Field, 2017), raw material heterogeneity is another important determinant of MO for the Canadian and Irish beef industries. This also involves identifying profitable technologies that contribute to the sustainability of the industries or to minimize biological variation in primary production to meet the demand for consistent quality from processors and consumers. However, as consumer demands become more differentiated, this natural variability of these resources can be used to match additional consumer demands in terms of product segmentation (Grunert, 2006a), as happened with for example Certified Angus and grass-fed beef products. In other words, the Canadian and Irish beef industries can take further control of their raw material, which leads to an increased level of market orientation (Trondsen and Johnston, 1998). As such, beef producers have to gather information about their way of doing business, e.g. whether the cattle breed they are using is matched to the environment they are operating in and whether the type of cattle fits the most economical combination of feed, labor, and other resources. In doing this, beef producers should pay attention to reproductive efficiency on the one hand and variability and availability of resources on the other hand present at their operations to respond to market signals and consumer trends (Field, 2017).

A different view on raw material heterogeneity is exploiting skills and core competencies such as marketing and management skills in e.g. animal husbandry and financial management to improve

beef operations' productivity and efficiency, and ultimately to better meet the needs of consumers and other actors in the industry (Micheels and Gow, 2015). Therefore, examples of improving profitable practices are exploiting genetic potential of animals, pasture management, disease control and prevention, compact calving patterns, as well as benchmarking against other producers and refining of financial statement understandings. Research from Ireland for example, has shown that improvements in production efficiencies are still possible for "average" suckler farms (Crosson et al., 2016). Besides individual beef producers, other actors in the beef industry play a role in this by providing beef producers with resources on how to improve their management and animal husbandry skills.

The last part of IG involves the awareness of regulations and trade agreements that can potentially affect the business environment of beef producers and other industry stakeholders, and therefore ultimately influence end consumers. Regulations and trade agreements specific to the Canadian and Irish beef industries have been discussed in Chapter 2, but examples include regulations concerning food safety, traceability and business management practices, and trade agreements like CETA, NAFTA and renegotiation following Brexit. Trade agreements are argued to affect the level of MO in two ways, namely that competitive pressure and the need for product differentiation will increase once trade barriers are removed, and homogenization of beef products might be required following trade agreements for standardization and traceability purposes. In both cases, a beef industry needs to be aware of these issues to satisfy its customers, improve its competitive position and thus increase the level of MO.

Finally, having industry foresight also means being able to anticipate on potentially fluctuating external market factors. Therefore, developing new products with higher degrees of differentiation based on these changing external market factors also involves learning about other actors within the beef industry to facilitate the information transfer necessary to function more efficiently and effectively as an industry and ultimately serve end consumers (Grunert, 2006b). This explains why the external market factors end-user heterogeneity and raw material heterogeneity are connected in the model presented in Figure 4.3.

4.2.2 Intelligence dissemination

Intelligence dissemination (ID) is defined as spreading the market intelligence regarding the external market factors across the value chain or industry using information systems and relationships between industry actors (Kohli and Jaworski, 1990). In practice, for the Canadian

and Irish beef industries this means that marketing information concerning consumers' future demand for beef products, strategic and business information of industry actors (e.g., processors, retailers, industry groups), as well as research and extension information regarding new production technologies need to be circulated within the beef industries to be able to implement a response to market intelligence. This information needs to be shared with individual beef producers in particular as their use of market intelligence is considered key to the competitiveness and MO level of the entire industry (Feola et al., 2015). ID also depends on the speed with which intelligence is spread among industry actors, as this can affect a timely reaction to external market factors.

Whereas different forms of information exchange are present in beef industries (e.g., price information, production contracts, grading systems), following Grunert et al. (2002; 2005) how information is essentially distributed depends on the connections between actors within the industry, the perceptions of key decision-makers in the industry (i.e., mental models, as used in the 2005 model), and other possible barriers. For the Canadian and Irish beef industries it is therefore argued that ID is determined by the information sources and channels used by individual beef producers, the social and professional relationships existing in the industry, and the psychometric characteristics of key decision-makers both at industry-level and farm-level.

Social and professional relationships of beef producers and within the entire industry refer to, amongst others, friendships, neighbors, communities, peers, competitors, business clubs (e.g., the BETTER Farm Beef Programme and Teagasc Beef Discussion Groups in Ireland), trade associations and producer organizations (e.g., Alberta Beef Producers, Canadian Cattlemen's Association, Irish Cattle & Sheep Farmers' Association, national or provincial cattle breed associations, crop or grassland associations), and relations with research institutes (e.g., Teagasc), other industry actors (e.g., Bord Bia, Meat Industry Ireland) and the government (Grunert et al., 2002). Some of these relationships influence or steer the way of thinking by setting rules or norms and by reaching across the entire industry, and can therefore boost the MO level as they are based on trust, mutual understandings and alignment of interests (Grunert et al., 2010). This in turn will decrease opportunistic behavior within the industry help spread information among industry actors, and help move from a commodity orientation to a market orientation (Henchion and McIntyre, 2010). Other relationships are simply consulted as part of the decision-making process.

The MO level of beef industries is also argued to be affected by the attitudes and willingness of key industry actors to spread intelligence about external market factors. These psychometric characteristics are potential barriers to ID and ultimately exploitation of opportunities, as they shape the interpretation of received information and therefore affect a key decision-maker's behavior such that his market-oriented activities are either inhibited or encouraged (Grunert et al., 2010). Different perceptions of different actors also depend on the geographical and mental distance between actors (Grunert et al., 2010), which may play a role in beef industries as they involve several stages from breeding through finishing cattle through processing, retailing and exports. Alignment with processors is particularly important, as they are key in transferring information between upstream and downstream actors. Similarly, beef producers with a breeding segment on their operation should be aligned with subsequent stages to ensure that the genetics produced meet customer needs (Field, 2017).

Finally, the information sources and channels that facilitate ID can have an effect on the MO level of beef industries. Examples of sources that help spread information regarding new production technologies or how to improve existing practices include extension tools and research outcomes from universities, research institutions (e.g., Teagasc in Ireland), and other industry actors (e.g., Beef Cattle Research Council in Canada). Other examples that help disseminate information regarding new production technologies are discussions in farm print media such as the Western Producer and Canadian Cattlemen in Canada and the Irish Farmer Journal in Ireland, as well as their social media accounts, interactions with other producers, industry meetings and advice from veterinarians and nutritionists. Similarly, examples of sources that help spread broader market information, including macroeconomic factors, consumer trends, trade developments and regulations, are market and price reports (such as CanFax updates or Chicago Mercantile Exchange (CME) reports in Canada and Bord Bia updates in Ireland, and beef factory prices), farm print media, social media and producer and industry meetings.

4.2.3 Intelligence responsiveness

Intelligence responsiveness (IR) is defined as using market intelligence in strategic decisions (Grunert et al., 1996). This can be done by different industry actors, such as processors being able to process different kinds of production specifications in response to trade requirements and consumer demands. It also depends on the speed with which responses are implemented in the entire industry, compared to competitors and further developments in external market factors. However, the focus of this model is on changes made on the farm level to create superior customer

value. As such, it can be argued that this is affected by the determinants social and professional relations, actual decision-making processes on individual operations and structural firm-specific factors. The actual decision-making processes on individual operations are in turn determined by information sources and channels, who is involved in the decision-making process and psychometric characteristics of producers.

As discussed under ID, social and professional relations facilitate the spreading of information throughout the industry by conforming norms, values, and the way of thinking within an industry, but these relations also play an important role in the ability to respond to received information. As such, the ability to respond to market intelligence is conditional upon the attitude, willingness, and perceptions in one's network to exploit heterogeneities (Grunert et al., 2002).

Decision-making processes on individual beef operations are key to responding to market intelligence, as the decisions made by farmers (e.g., adoption decision of a certain technology) are critical to the competitiveness and level of market orientation of the entire industry (Feola et al., 2015). Producers who are able to use their skills or qualifications to respond to differentiated consumer demands may have a competitive advantage compared to their peers. It can be argued that decision-making processes on beef operations are influenced by who is actually involved in this process, especially since many beef operations are run by multiple generations and people (e.g., husband and wife, non-family partners) and farmers tend to consider advice from other professionals such as accountants, extension specialists, nutritionists and veterinarians. In terms of responding to market intelligence, a continuum of decisions ranging from operational and strategic, as well as situation-specific decisions like buying and selling are key. Examples of strategic decisions include which production system to utilize (e.g., organic vs. conventional), which breed to use and time of calving and weaning to coincide with feed availability. Likewise, examples of buying or input decisions concern feed and additional or replacement animals, while examples of marketing or selling decisions concern timing, marketing outlet and target weight. Operational or day-to-day decisions are often affected by developments on the farm, such as weather, soil and crop condition, and the financial situation. These decisions overlap as some can be categorized as, for example, both strategic and marketing-related.

Farmers' decision-making behaviors, and therefore their response to market intelligence, are affected by the information sources they consult, and different information sources are perceived differently by individual farmers, both in terms of credibility and perceived influence. Farmers

tend to use information sources from multiple mediums and origins to validate its contents and justify their ultimate decision, and use a different combination of information sources depending on the situation of decision-making. As such, it can be argued that some information sources are consulted more frequently than others, given the nature of the decision. In terms of responding to market intelligence, it should be noted that the use of records, historical farm data and farm accounts are key to be able to make changes as they tend to give an overview of productivity and efficiency performance. Examples of these include a breeding plan, animal health plan, birth and weaning weights, a marketing plan, and production costs per animal or acre/hectare. Other factors that affect a farmer's decision-making behavior include his level of risk aversion, willingness to learn and investigate new practices and methods, ability to reflect on mistakes and anticipate on future problems or opportunities (Nuthall, 2010).

IR is also affected by the mental models or psychometric characteristics of key decision-makers, in this case the beef producer himself. Mental models are defined as the deeply ingrained assumptions and generalizations about the world, they play a significant role in how people respond to a problem or issue (Kohli and Jaworski, 1996) and how decision-makers view external market factors as determinants of competitive advantage (Grunert et al., 2010). For example, a beef producer could perceive current consumer demands as less heterogeneous, intelligence regarding external market factors is not available to the beef producer or responding to demands would not be profitable for his particular farm business (Grunert et al., 2002). Due to uncertainty a beef producer might also decide not to invest in a so-called transaction-specific asset as part of responding to market intelligence, such as investing time in keeping records to prove compliance with feed and health protocols, making capital expenditures for farm improvement, investing time to manage a certification system. Even when such an investment could improve the producer's profitability in the long run, a producer might avoid vulnerability regarding consumers (Grunert et al., 2002) or not be willing to change production practices that have been used for years (Nuthall, 2010). This all can lead to homogenization of beef products and being driven by supply rather than demands. However, when a beef producer does perceive external market factors as basis for competitive advantage, he responds to this market intelligence and engage in market-oriented activity (Grunert et al., 2010). Another important aspect affecting the willingness to respond to market intelligence is the level of experience of beef producers, as generally more experience leads to less openness to change, willingness to question current business models, acceptance and adoption of new methods on the operation, and a higher degree of confirmation bias that devalue performance benefits from responding to market intelligence (Micheels, 2014;

Micheels and Gow, 2015). Considering the relatively high average age of producers (Dillon et al., 2017; Statistics Canada, 2017b) and thus possibly experience, this could potentially decrease the degree of IR and therefore MO.

Structural firm-specific factors could also play a role in responding to market intelligence. For example, the level and advancement of skills present on a beef operation might limit the intelligence responsiveness and value-creating process if the organization lacks certain skills or resources required to make changes (Grunert et al., 1996). The production system used on individual operations and the end destination are also thought to be of effect on intelligence responsiveness. If a beef producer is already complying with certain standards or quality assurance schemes (e.g., Verified Beef Production (Plus) (VPB+) in Canada, Bord Bia Beef Quality Assurance Scheme (BQAS) in Ireland), it is probably likely to make more changes in the future. If a beef producer is aware of the end destination of his beef, whether that is local, domestic or international, this determines the required specifications and therefore necessary adaptations to production practices. Other structural firm-specific factors that can affect IR include for example having an off-farm income or other agricultural enterprises (e.g., crops) leading to high opportunity costs of reallocating human and capital resources to the beef enterprise, as well as size, age and how ownership is organized (i.e., how many stakeholders are involved).

Finally, it is argued that the process of generating, diffusing and reacting of market intelligence is an ongoing evolutionary process as the industry's environment is constantly changing (Avlonitis and Gounaris, 1999), causing IR to feed back into IG in this model. IR also affects ID as responding to external market factors such as heterogeneous consumer demands and competitive pressure by being more market oriented, could facilitate additional information exchange (Grunert et al., 2010) and the need to make use of market intelligence now and in the future.

4.3 Contributions and hypotheses

After discussing the modified conceptual model and its determinants for the Canadian and Irish beef industries in depth, this section places the model in a broader context and discusses its contributions as well as the focus for this thesis. This section ends with presenting the hypotheses to be tested in the empirical part of this research.

Previous conceptual models regarding the MO level of agri-food value chains are somewhat limited as some determinants only applied to one or two case studies, and are not consistent over

time as some were only used in the early model from 2002 but not in the later model from 2005. Another major drawback of these models is that, although they are based on the MO concept, they do not include the further specifications by Kohli and Jaworski (1990) (i.e., intelligence generation, intelligence dissemination, intelligence responsiveness) or Narver and Slater (1990) (i.e., customer orientation, competitor orientation, and interfunctional coordination). Therefore, the conceptual model developed in this thesis contributes to the existing literature by incorporating these elements and extending it to the industry level. As the central theme of this thesis is how agricultural industries, with beef industries in particular, respond to their changing market and business environment by making use of information about external market factors, the specifications by Kohli and Jaworski (1990) are most suitable.

As the modified conceptual model as shown in Figure 4.3 is complex and includes many factors and industry actors, it is chosen to study this conceptual model from only one perspective as a start. The individual beef producer's perspective is selected as market orientation of upstream actors is of importance because it indicates how these actors can be recruited to create more customer value, and so increase the performance of the entire industry (Trondsen and Johnston, 1998). In other words, producers' grassroots decision-making influences the competitiveness level of the entire industry. Therefore, an assessment of whether external market factors that require action are actually an issue in the mental models of individual beef producers is a start to understand the determinants of MO at the agricultural industry level (Grunert et al., 2010).

While other studies focus on the relationship between the level of MO and other variables, (e.g., entrepreneurial orientation, new product sales, environmental turbulence, competitor orientation or innovation (e.g., Micheels and Gow, 2012b; Mirzaei et al., 2016)), this thesis focuses on MO only. By doing this, the depth of MO concepts, its corresponding intelligence specifications and rich context of agricultural industries are explored, before a proper implementation in terms of consequences is possible.

Based on this modified conceptual model and its empirical counterpart as presented in Figure 4.4, hypotheses are formulated to be tested in the empirical part of this thesis. To further limit the complexity and to be able to test the determinants of the MO level at the agricultural industry level, the content of the hypotheses is restricted to the MO concept and its intelligence specifications only. The methodology concerning how these hypotheses will be tested in the empirical part of this thesis will be described in the next chapter.

For the Canadian and Irish beef industries:

1. ... intelligence generation has a positive effect on the level of market orientation
2. ... intelligence dissemination has a positive effect on the level of market orientation
3. ... intelligence responsiveness has a positive effect on the level of market orientation
4. ... intelligence generation has a positive effect on intelligence dissemination
5. ... intelligence dissemination has a positive effect on intelligence responsiveness
6. ... intelligence responsiveness has a positive effect on intelligence generation
7. ... intelligence responsiveness has a positive effect on intelligence dissemination
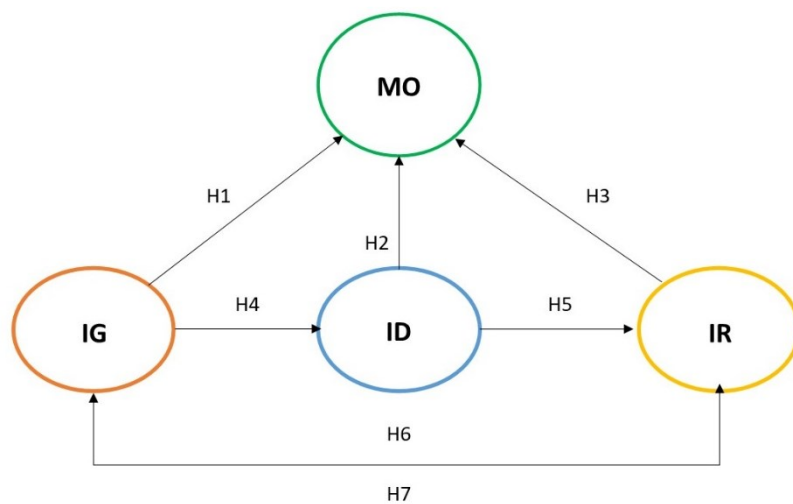
Figure 4.4: Empirical model

Chapter 5: Methodology

The objectives of this thesis were formulated in Chapter 1 as to adapt the concept of market orientation to the agricultural industry level with the Canadian and Irish beef industries as examples and to investigate the determinants of the level of market orientation for these two industries specifically when coping with market uncertainties. A final objective is to model and quantify the level of market orientation for agricultural industries that can be used as a benchmark and comparison tool. After giving an overview of the Canadian and Irish beef industries and their challenges and opportunities in Chapter 2, analyzing these objectives within the context of the academic literature in Chapter 3 and developing a conceptual framework in Chapter 4, hypotheses were formulated.

To test these hypotheses and be able to find an answer to how agricultural industries make use of market intelligence when responding to their changing market and business environments, a plan needs to be formulated on how to conduct this research in practice. Therefore, the goal of this chapter is to provide an overview of the methodological considerations associated with this thesis. As such, this chapter contributes to answering the second research question, i.e. "How can the concept of market orientation in an agricultural setting at industry level be modeled and quantified?" Section 5.1 presents general methodological considerations ending with the choice of data collection method, while Section 5.2 discusses how the market intelligence and decision-making concepts are operationalized and measured using the chosen data collection method, how the data collection method is adapted to the context of the Canadian and Irish beef industries, and other design issues. Section 5.3 describes how the data collection method was piloted, which is followed by a discussion of how the survey was implemented in practice in Section 5.4. The chapter ends with an empirical strategy of how to analyze the data and test the hypotheses regarding the level of market orientation for agricultural industries in Section 5.5.

5.1   Broader methodological considerations

Before deciding on the data collection and analysis methods, the appropriate research philosophy, research approach, and research strategy have to be considered to guide and justify the decision of data collection and analysis methods for this thesis (Saunders et al., 2009). These broader methodological considerations are following the layers of the "research onion" as displayed in Figure 5.1.
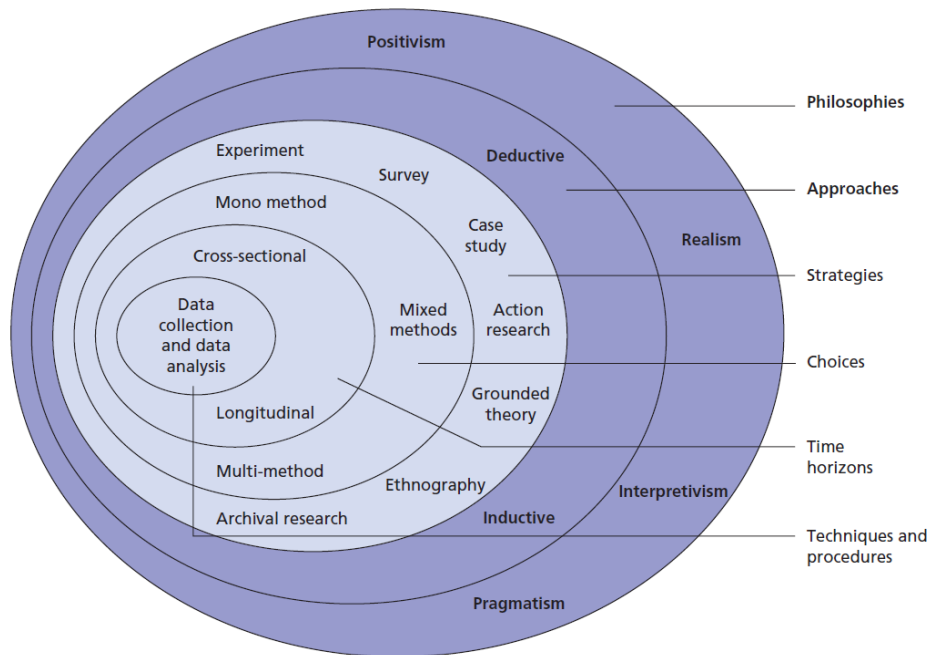
Source: Saunders et al. (2009)

Figure 5.1: The "research onion"

The overall direction of conducting research is provided by research philosophies, which are related to, within a certain view of the world, how in a research project knowledge is developed and what the nature of that knowledge is. Every study is aimed at acquiring new knowledge and should therefore be guided by a research philosophy, which affects the decisions made in later stages. The four main research philosophies are positivism, realism, interpretivism, and pragmatism (Saunders et al., 2009). The research philosophy of positivism can be summarized as theory verification, as often hypotheses are developed from existing theory to generate specific 'laws'. Realism is somewhat similar to positivism in that observable phenomena and facts are seen as acceptable knowledge, and that reality is objective and independent of social actors and their minds. The focus of the interpretivism research philosophy is on understanding social phenomena as opposed to objective facts that lead to certain laws. Lastly, the research philosophy of pragmatism can be characterized as problem-centered and real-world practice oriented, as it is being led by the research questions surrounding a particular problem and either or both observable data and social phenomena are seen as acceptable knowledge. The pragmatism research philosophy is employed for this thesis, as this thesis focuses on refining the theoretical concept of MO and testing hypotheses concerning the MO level of the Canadian and Irish beef industries by exploring the functioning and mechanisms of agricultural industries when making

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use of market intelligence. In doing that, real-world cases like the Canadian and Irish beef industries are considered.

The next step is to reflect on which research approach to use following the pragmatist philosophy, i.e. how to view the relation between theory and observations or findings. The deductive approach can be characterized as testing theory by following a linear, logical sequence of steps from constructing hypotheses to analyzing the outcomes. When using an inductive approach, theory is built as an outcome of the research by analyzing observations and has an iterative nature by going back and forth between observations and theory to further refine theoretical concepts. This thesis employs the deduction approach as the main research approach as there is a vast amount of literature concerning MO from which a conceptual framework and hypotheses can be developed, which in turn lead to the process of gathering and analyzing data. Therefore, a deductive approach helps in understanding causal relationships between the intelligence concepts and the MO level for beef industries. However, deduction is combined with induction in a repetitive way in this thesis, as this thesis also aims to observe how beef producers perceive the use of market intelligence within their industry.

A different light shed on the research approach is the nature of the research, i.e. exploratory, explanatory or descriptive. Again, as the objective of this thesis is to further build theory concerning market orientation but in the context of agriculture, as well as test hypotheses regarding the determinants of market orientation of agricultural industries, this thesis can be characterized as both exploratory and explanatory research.

Given a pragmatist philosophy, a deductive approach and the plan to conduct research in an exploratory and explanatory way, the research strategy is a more detailed plan of action of how to collect data, although different methods of data collection are possible within each strategy. Possible options for a research strategy include experiments, survey, case study, action research, grounded theory, ethnography, and archival research (Saunders et al., 2009). This thesis employs the case study strategy to explore the existing theory of MO and to gain a rich understanding of the functioning and organization of beef industries in Canada and Ireland particularly. Sterns et al. (1998) further argue that case studies are particularly useful for executing studies in agribusiness, since there is an increased interest in motivations and strategies underlying decision-making within firms, agri-food value chains or agricultural industries, which limits the applicability of other research strategies. In addition, Yin (2009) argues that case studies are the most appropriate research strategy when controlling the contextual variables is not an option, and

when the relevant time frame is the present. Both conditions hold in studying the Canadian and Irish beef industries since we are interested in how market intelligence is being used when responding to external market factors; since contextual variables like production systems, market conditions and regulations cannot be controlled; and since we are planning to study the current status of the beef industries as a relevant time frame. Therefore, the beef industries in Canada and Ireland will function as the unit of analysis and demonstrate the determinants and level of market orientation of an agricultural industry.

Within the case study research strategy, a wide range of research methods can be used. Examples are interviews, focus groups, observations, as well as questionnaires and documentary analysis (Saunders et al., 2009). The choice for the most appropriate research method for this thesis is determined by the research perspective being quantitative or qualitative or a combination (i.e., mixed methods), and the need for collecting primary or secondary data. Specific data are needed about how actors within beef industries perceive the factors outlined in the conceptual model, i.e. how they value the use of market intelligence within their industry. Therefore, although the process of collecting primary data might be time consuming and expensive, for this thesis we collect primary data to find out the perceptions of beef producers of different factors associated with the market orientation of their industries, which is not be available with secondary data. A qualitative viewpoint could provide the opportunity to go in depth and investigate all the details of the case studies, respondents and their thoughts using methods like observations, panels, interviews, or focus groups, and resulting in a broad overview of the perceptions of respondents. A quantitative viewpoint could provide an overview of respondents' perceptions by numeric values and so could produce a tool to make easy comparisons between the two beef industries and their structures using methods such as questionnaires or documents. This thesis employs a quantitative viewpoint to be able to meet the objective of quantifying the level of market orientation for agricultural industries that simultaneously can be used as a benchmark.

A different reason to use a quantitative viewpoint in this thesis is that it contributes to the existing academic literature. Grunert et al. (2002; 2005) developed conceptual models regarding MO based on four case studies in the food industry but used a qualitative viewpoint and associated research methods. Therefore, studying the determinants of the MO level of agricultural industries from a more quantitative viewpoint and to be able to generate laws by testing hypotheses, will complement the qualitative analyses conducted by previous authors.

Within the quantitative viewpoint, this thesis employs a survey as the research method to measure the MO level of beef industries from a producer's perspective, which can be administered using a

questionnaire, in person, online or drop and collect. This thesis employs an online questionnaire as in that case there is no influence of the researcher at the time of data collection, beef producers can work on their own pace and time when filling in the questionnaire, especially when personal questions are included; anonymity can be ensured, and a wide distribution of questionnaires is possible (Pennings et al., 2002). However, disadvantages of an online questionnaire include the limited ability to inquire about sensitive topics and the inability to control the response situation (Blair et al., 2014). But, an online questionnaire also allows to have control over the research process by using a fixed questionnaire with prespecified questions, easy comparison due to standardized data, and relatively low costs of administration (Saunders et al., 2009; Blair et al., 2014). Online questionnaires are preferred over mail questionnaires due to being able to control that all questions are filled in, absence of sequence bias as respondents are not able to view the entire questionnaire beforehand (Pennings et al., 2002), the possibility of routing respondents through questions, and zero mailing costs.

5.2   Survey design

To have information about the level of market orientation and the use of market intelligence of beef industries from an individual beef producer's perspective, data are needed regarding the beef producer's level of agreement with the current practices concerning market intelligence in their industries and how currently decisions are being made on his or her operation support the degree of market orientation of the overall industry.

5.2.1   Market orientation measures

A first step in designing the online questionnaire is to further operationalize the concepts in the conceptual model and hypotheses to researchable entities that can be measured quantitatively, which will function as variables in the data analysis part. Different measurement scales have been developed in the literature to measure the level of market orientation, either designed with a single firm or a supply chain as the unit of analysis. Two scales in particular have been reused often, in the way they were developed initially or as a basis for adaptation. These are the market orientation measurement scale called MKTOR by Narver and Slater (1990) and the market orientation measurement scale called MARKOR by Kohli et al. (1993) based on their definitions of market orientation, respectively.

Following Narver and Slater (1990)'s definition of market orientation, MO consists of customer orientation, competitor orientation, and interfunctional coordination. After testing MKTOR, its final version consists of six items that measure customer orientation, four that measure

competitor orientation and five that measure interfunctional coordination, respectively (see Table 5.1). As such, customer orientation, competitor orientation and interfunctional coordination are measured as latent variables based on the weighted average of their respective items. The scores are quantified by means of Likert scales, in the case of MKTOR a 7-point Likert scale was used. Finally, MKTOR measures market orientation as a latent variable based on a weighted average of all the items used. Therefore, when measuring MO using MKTOR scores range between a minimum of 15 and a maximum of 105.

A similar procedure is used for the composition of MARKOR, the measurement scale developed by Kohli et al. (1993) following their definition of market orientation as consisting of (market) intelligence generation, intelligence dissemination and intelligence responsiveness. The final version of MARKOR consists of six items that measure intelligence generation, five that measure intelligence dissemination, and nine that measure intelligence responsiveness, respectively (see Table 5.1). As such, intelligence generation, intelligence dissemination and intelligence responsiveness are measured as latent variables based on the weighted average of their respective items and a 7-point Likert scale. Like MKTOR, MARKOR then measures market orientation as a latent variable based on all the items used. Therefore, when measuring MO using MARKOR scores range between a minimum of 20 and a maximum of 140. Table 5.1 also highlights additional differences between the MKTOR and MARKOR measurement scales.

Table 5.1: Overview and comparison of MARKOR and MKTOR measurement scales

MARKOR	MKTOR
Intelligence dissemination	*Customer orientation*
In this business unit, we meet with customers at least once a year to find out what products or services they will need in the future	Customer commitment
In this business unit, we do a lot of in-house market research	Create customer value
We are slow to detect changes in our customers' product preferences	Understand customer needs
We poll end users at least once a year to assess the quality of our products and services	Measure customer satisfaction
We are slow to detect fundamental shifts in our industry (e.g., competition, technology, regulation)	After-sales service
We periodically review the likely effect of changes in our business environment (e.g., regulation) on customers	
Intelligence dissemination	*Competitor orientation*
We have interdepartmental meetings at least once a quarter to discuss market trends and developments	Salespeople share competitor information
Marketing personnel in our business unit spend time discussing customers' future needs with other functional departments	Respond rapidly to competitors' actions
When something important happens to a major customer or market, the whole business unit knows about it within a short period	Top managers discuss competitors' strategies
Data on customer satisfaction are disseminated at all levels in this business unit on a regular basis	Target opportunities for competitive advantage
When one department finds out something important about competitors, it is slow to alert other departments	
Intelligence responsiveness	*Interfunctional coordination*
It takes us forever to decide how to respond to our competitor's price changes	Interfunctional customer calls
For one reason or another we tend to ignore changes in our customer's product or service needs	Information shared among functions
We periodically review our product development efforts to ensure that they are in line with what customers want	Functional integration in strategy
Several departments get together periodically to plan a response to changes taking place in our business environment	All functions contribute to customer value
If a major competitor were to launch an intensive campaign targeted at our customers, we would implement a response immediately	Share resources with other business units
The activities of the different departments in this business unit are well coordinated	

Customer complaints fall on deaf ears in this business unit	
Even if we came up with a great marketing plan, we probably would not be able to implement it in a timely fashion	
When we find that customers would like us to modify a product of service, the departments involved make concerted efforts to do so	

When selecting a measurement scale to quantify the level of market orientation of agricultural industries, an advantage of the MKTOR scale is that is has been applied in agricultural contexts before (e.g., Mirzaei et al., 2016), and for beef producers specifically (e.g., Micheels and Gow, 2011a; 2012a). Drawbacks of this measurement scale are, however, that it does not emphasize the speed of using intelligence (Tomásková, 2009) and it does not incorporate the three market intelligence concepts as specified in the conceptual model in Chapter 4. On the other hand, advantages of the MARKOR measurement scale by Kohli et al. (1993) are that it can be used as an initial diagnosis of the current MO level and it has been applied beyond the individual firm level (e.g., Grzeskowiak et al., 2007). However, both MKTOR and MARKOR are found to be inadequate and to have a poor empirical fit based on the goodness of fit index (Farrell and Oczkowski, 1997). Matsuno et al. (2000; 2005) responded to this issue by improving the MARKOR measurement scale by incorporating a broader range of questions such as macroeconomic and regulatory factors. With this improved measurement scale, the market orientation concept is proposed as a first-order construct, the market intelligence concepts as second-order constructs, and the respective items as indirect measures of both types of constructs (cf. the square boxes in Figure 5.2). More specifically, all the items used in the MARKOR scale developed by Kohli et al. (1993) were a direct measure of the latent variable market orientation (i.e., market orientation was a weighted average of the scores on all these items), whereas in the improved scale by Matsuno et al. (2000; 2005) the items are a direct measure of the three intelligence latent variables which in turn are a direct measure of the latent variable for market orientation. This results in a tiered model structure as is shown in Figure 5.2.

Results indicated superiority of this newly developed measurement scale in terms of conceptuality and reliability. This new measurement scale was applied by, for example, Min et al. (2007) at the supply chain level.
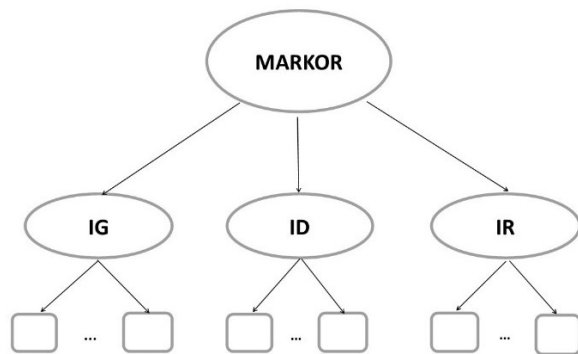
Source: Matsuno et al. (2000)

Figure 5.2: Second-order factor structure of MARKOR

To determine the level of market orientation of Canadian and Irish beef industries from a producer's perspective in this thesis, the MARKOR measurement scale developed by Kohli et al. (1993) and improved by Matsuno et al. (2000) and Min et al. (2007), are combined and tailored to the respective beef industries. The main reasons for using MARKOR as a measurement scale is that it includes the three market intelligence concepts and has been applied to measure the level of market orientation of a network (Grzeskowiak et al., 2007) and supply chains (Min et al., 2007), as opposed to the firm level in case of MKTOR. This would give a good starting point to extend MARKOR to the industry level in the context of agriculture. As such, an adapted measurement scale is developed with a general market orientation concept as a first-order construct and the intelligence concepts as second-order constructs to align with the conceptual model and hypotheses developed in Chapter 4.

5.2.2 Adaptation of MARKOR to Canadian and Irish beef industries

However, the main issue with the chosen measurement scale is that MARKOR was designed with mainly marketing managers, CEOs and other business professionals in mind. It therefore needs to be altered to farmer language without significantly changing the original intention of the scale and thus maintaining consistency with the existing literature. Besides that, it also needs to be adapted to the context of the beef industries and farm businesses. A recursive process of minor changes as well as a pilot process in both Canada and Ireland (see Section 5.3) were used to convert the measurement scale to farmers' language and the context of the two beef industries. Examples of these minor changes include replacing "we" with "beef industry", "users" with "consumers", and "departments" with "organizations" (cf. Table 5.3 in Section 5.3).

The main differences are the added statements regarding general market orientation to be able to investigate producers' opinions concerning current and future use of market intelligence within their industries and to align with the structure proposed by Matsuno et al. (2000). An increased number of reversed statements was added to reduce respondent fatigue. Furthermore, as market orientation can be perceived as a complex concept, a textbox with its definition was added for more clarity ("Market orientation has to do with gathering market intelligence with the goal of satisfying consumers' needs and establishing a competitive position, how this information is shared throughout the industry, and how the industry reacts to it accordingly"). This was followed by a description of what was intended by "industry". The differences between the Canadian and Irish version of the questionnaire will be described in more detail in Section 5.3. Table A.1 in

Appendix A compares the measurement scale as adopted by Min et al. (2007) and the one adopted for the questionnaire in this thesis, with the Canadian version as an example.

Respondents are able to indicate their level of agreement with the statements using a Likert scale, given its simplicity and reliability of results (Likert, 1932). Reliability of this instrument depends on, amongst others, the number of response categories available and the inclusion of a neutral category. Asún et al. (2016) add that Likert scales using four to seven points are most commonly used to prevent lack of validity. However, as some statements might be sensitive to beef producers and thus to avoid neutral answers (Micheels, 2010) on these issues and to have an optimal level of accuracy, in this case it is chosen to use a 6-point Likert scale ranging from "definitely disagree" to "definitely agree".

5.2.3 Measurement of external market factors and producer decision-making

In order to be able to use market intelligence to respond to external market factors, information is needed to what extent these factors are considered to be of significant influence on the industry as perceived at the producer level. To that end, statements were formulated to capture beef producers' perceptions of external market factors and to what degree they are perceived to be an opportunity or challenge to their industry. As the external market factors are different for the Canadian and Irish beef industry, two sets of statements were developed based on the issues presented in Chapter 2. The final set of statements is shown in the Canadian version of the questionnaire in Appendix B. For consistency with the market intelligence statements, a 6-point Likert scale is used.

The measurement of producer decision-making is split into two parts, namely the frequency use of information sources in different decision-making situations and producers' psychometric characteristics. Based on the discussion of decision-making and use of information sources in Chapter 3, the different decision-making situations regarding beef operations are categorized as operational or day-to-day management decisions, strategic decisions, buying decisions and selling decisions, and the frequency to use information sources ranges from daily to annually or not at all with seven categories in total. Producers can choose between ten categories of information sources, such as advisors, extension tools and research outcomes, family members, farm print media, market and price reports, other (beef) producers in general, other beef producers in an informal setting, producer and industry meetings, social media, and farm accounts and financial

records, which were selected and summarized based on used information sources in other studies as discussed in Chapter 3. Examples of these sources are given and adapted to Canada and Ireland.

To measure producers' psychometric characteristics, the extensive questionnaire designed by Nuthall (2010) to measure the level of managerial and entrepreneurial skills as well as other personal attributes among farmers was taken as an example. The questionnaire developed by Nuthall covered multiple themes to capture a farmer's decision-making style, such as planning, anticipation, familiarity with technologies, record-keeping, belief of control about the destiny of the farm, and the ability and willingness to learn. As such, careful consideration was given to cover the most relevant themes or combine statements from a specific theme into one statement, as well as making the total questionnaire of this thesis not too lengthy. Statements were specifically selected following their fit to other questions regarding information sources and to be able to test for the traditional nature of the beef industries. For example, experience, emotions and record-keeping are also a kind of information source for operational decisions, while product prices and the factors behind it can be consulted for marketing decisions. Similarly, when beef producers continue to use the same production methods or are not willing to change or critically reflect on their operation, this might indicate a limited degree of responsiveness to market intelligence on the farm level. This in turn might be caused by the relatively high average age of beef producers in both Canada and Ireland, or the traditional character of both beef industries.

As this questionnaire was specifically designed with sheep farmers in mind, some of these statements have been adapted to measure psychometric characteristics of beef producers to be able to provide context to their decision-making processes when using market intelligence and responding to external market factors. In addition, the questionnaire by Nuthall (2010) covered multiple themes and, so careful consideration was given to cover the most relevant themes or combine statements from a specific theme into one statement, as well as making the total questionnaire not too lengthy.

This all resulted in a total number of ten statements that cover the wide range of areas described above. Table 5.2 shows the differences between original and adapted statements. For consistency with the market intelligence and external market factor statements, a 6-point Likert scale is used.

Table 5.2: Comparison of psychometric statements and adapted statements

Statements as used by Nuthall (2010)	Adapted statements
I'm using exactly the same production methods that I have used for many years as they have stood the test of time	I **am** using exactly the same production methods that I have used for many years as they have stood the test of time
When things go wrong it is so often due to events beyond my control – the weather ruins the hay, the wool auction I choose has a sudden price dip, etc.	My day-to-day decisions are colored by my emotions because of what happens in my immediate business environment, e.g. weather, machinery breaks down
Often I get frustrated as circumstances beyond my control impede the smooth progress of my management plans	
Being prepared to give it a go and take risks in changing production systems and/or starting new ventures	Change means opportunity
Being able to seek out, identify, and clarify new opportunities (production, products, marketing, etc.)	
You generally choose conclusions from experience rather than from hunches when they are in conflict	In times of business challenges, I rely on experience rather than external information
Understanding sources of risk and what can be done to reduce their impact is an important entrepreneurial skill	Understanding sources of risk and what can be done to reduce their impact is **key to good decision-making**
The ability to learn from experience, mistakes, and failures is an important personal attribute	I am not afraid to reflect critically on the beliefs and assumptions we have about the way we farm
You find investigating new farming/growing methods exhilarating and challenging	Original ideas are highly valued in running my operation
Being up-to-date with the current condition of the property in its totality (bank balances, animal condition, crop growth, soil moisture, feed levels, machinery repair, etc.) is an important managerial attribute	Being up-to-date with the current condition of the operation it its totality (e.g. bank balances, animal condition, crop growth, soil moisture, feed levels, machinery repair) is **key to good decision-making**
The ability to predict product prices into the foreseeable future, or at least understanding the factors that determine the prices, and understand market requirements is an important managerial attribute	The ability to predict product prices into the foreseeable future, or at least understanding the factors that determine the prices, and understand market requirements is **key to good decision-making**
An ability to look ahead and anticipate likely problems, needs, and opportunities is an important entrepreneurial skill	An ability to look ahead and anticipate any likely problems, needs and opportunities is **key to good decision-making**

5.2.4 Other considerations in survey design

To complete the survey, a number of background questions are asked to be able to classify the responses to the statements. Background questions are related to the structure of the beef operation (e.g., beef vs. mixed, size in animal numbers, cow-calf vs. backgrounding vs. feedlot, off-farm income), decision-making (e.g., if the respondent is the primary decision-maker, who

else is involved), and demographics (e.g., age, experience, education). Other questions include, which production system is adhered to, which market is produced for, and which organizations and groups the beef producer is a part of. These questions were mostly designed in a closed, binary or multiple-choice format, allowing the respondent to just tick boxes, which are preferred over open-ended questions and questions in which farmers have to consult their records (Pennings et al., 2002). Exceptions are for providing numbers for different kinds of animals, the number of acres or hectares as total farm size, and the number of years of experience, which are expected to be filled in based on memory.

To not lose respondents' interest in the survey, the questionnaire started with six background questions (Section A), followed by the statements about external market factors to introduce the respondents to the main topic. This was followed by the definition of market orientation, what is intended by "industry" with some examples, the statements about market intelligence (Section B), the choices regarding information sources and their frequency of use, the statements about psychometric characteristics (Section C) and finally the remaining background questions (Section D). Respondents who answered no to the first background question were directed to the end of the survey as they were not the target audience of this survey (see Section 5.4). Respondents who did not have a cow-calf or suckling enterprise on their operation did not have to characterize that enterprise in the next question.

A cover letter was designed to improve response rates (Pennings et al., 2002) and to demonstrate compliance with ethical guidelines regarding confidentiality. Other elements of the cover letter were the estimated time of completing the survey, the objective of this thesis, and the benefits for producers as a result of participating in the survey. The cover letter also included the logo of the University of Alberta for the Canadian version, and both logos of the University of Alberta and Teagasc for the Irish version, as studies sponsored by universities and non-profit organizations could stimulate the response rate (Pennings et al., 2002). The entire cover letter can be found in Appendix B.

After the cover letter, respondents were directed to a consent statement, where they could (dis)agree whether the purpose of this thesis was explained to them, their questions have been answered, they know who to contact in case of additional questions, and their consent to participate. Respondents who disagreed with the above were directed to the end of the questionnaire without participating, whereas respondents who agreed were directed to the first

set of background questions. At the end of the questionnaire following participation, respondents were asked to provide suggestions or remarks on the contents of the survey and the possibility of submitting their email address to receive a summary report. Respondents were ensured that this personal data would not be shared beyond the research team.

Furthermore, in designing the survey careful consideration was given to a high degree of structure to increase reliability of this research method (Saunders et al., 2009) and the convenience for respondents. This was executed by sticking to a 6-point Likert scale throughout the entire questionnaire, limiting five statements per page and mainly providing closed format questions for the background questions. Another important consideration is the length of the questionnaire, which can significantly impact the response rate, especially among farmers, and also increases by the number of open-ended questions (Pennings et al., 2002). The average time to fill in the questionnaire was aimed at 15 minutes maximum, as farmers are willing to spend 13 minutes on surveys on average (Pennings et al., 2002). Although about 50% of farmers expects to be compensated for completing a survey depending on its length, they generally do not expect a (high) compensation when the survey is part of university research (Pennings et al., 2002). Therefore, and due to limited financial resources, a monetary incentive was not offered. However, a summary report can be provided to those interested respondents as some form of reimbursement.

5.3 Pretesting

To increase the validity of this research instrument (Saunders et al., 2009), the questionnaire has been pretested in multiple rounds. The main goals of pretesting were to test whether the questionnaire was altered significantly to match industry relevant language, to estimate the completion time, to discover questions that respondents do not understand or do not know how to answer, and to identify other response problems. Different pretest methodologies can be used, but it is generally recommended to use a combination of respondent-based methods and non-respondent-based procedures (e.g., an expert panel), and to allocate resources like labor and available time wisely. Pretest samples are typically small and conditional upon available resources and coverage of different subgroups of the target audience (Blair et al., 2014).

Following these recommendations, the questionnaire has been pretested using both an expert panel and beef producers from different subgroups of the population. The first round of pretesting involved beef producers that were selected to limit the risk of misinterpretation of the developed

statements. The beef producers for this round were selected to reflect the heterogeneity in beef operations as discussed in Chapter 2. As such, three beef producers from Alberta participated in this round of pretesting. Two of these beef producers could be characterized as mainly backgrounders (one fairly traditional and small scale, the other more progressive and with operations in four locations in two provinces), while the other one is mainly a cow-calf producer. One of these beef producers is also known as an "industry leader", as he supports other beef producers in the province by giving advice on production and financial matters.

The second and third round of the pilot process involved research and industry people from Canada and Ireland, respectively. Participants in this round of piloting were selected due to their involvement with beef research (i.e., applied to economics of beef production, technical beef production at a research farm or demand by beef producers in Alberta in the case of Canada, and as part of Teagasc in the case of Ireland).

Several changes were suggested following this pilot process, as presented in Table 5.3 and Table 5.4 for the market intelligence statements and psychometric statements, respectively. The complete questionnaire for Canada can be found in Appendix B. The most important change to the design of the survey involves a 7-point Likert scale instead of a 6-point Likert scale, to align with the study by Min et al. (2007) and to give respondents a "don't know" or neutral option. Due to the traditional character of both beef industries, producers might not be aware of or care about the contents of certain statements, leading to false data interpretations when using a 6-point Likert scale. The wording of the Likert scale was also formalized, ranging from "strongly disagree" to "strongly agree" instead of "definitely disagree" to "definitely agree".

The statements regarding general MO were condensed from seven into two statements to reduce the length of the questionnaire and cover the most important aspects and were also placed at the end of the market intelligence section due to rank of importance. The definition of market orientation as presented in the box was changed to resemble the definition by Kohli and Jaworski (1990) and with a focus on market intelligence instead of market orientation to increase clarity for respondents. The new definition is as follows: "Market intelligence is the consideration of external market factors that can affect current and future consumer demands and preferences." Following this new definition, the beginning of Section B of the survey was reworded in terms of "external market factors" instead of "market challenges". The statements in this part of the survey were also reworded with using "opportunities and threats" instead of "opportunities and challenges", as a challenge can also be interpreted as something positive indicating a small

contrast between "opportunities" and "challenges". The description of what is intended by "industry" prior to the market intelligence statements was condensed, and the market intelligence statements were further refined by including examples specific to the Canadian and Irish beef industry instead of keeping the statements in general marketing terms to increase use of industry terminology. The statements regarding psychometric characteristics were adapted in terms of content to better reflect original statements by Nuthall (2010) and were structured as what constitutes good decision-making according to producers to increase consistency among statements and therefore convenience for respondents.

Other minor changes included the refinement and formalization of the cover letter, the extra emphasis on certain words for clarity by bolding some words, and the removal of some background questions.

As the Canadian and Irish beef industries differ in terms of their structure, size, employed production systems and economic and political factors (as described in more detail in Chapter 2), two versions of the questionnaire were developed. In Section A, the description of livestock enterprises was adapted to terminology used in Ireland, and the description of external market factors and "industry" was adapted to the Irish context in Section B. The order of information sources with more emphasis on extension tools was changed in Section C, together with the description of quality assurance schemes and the use of hectares instead of acres in Section D. Other minor differences include the use of "Irish" instead of "Canadian", the examples of farm print media and market and price reports, the use of counties instead of provinces, and different educational and legal ownership terminology. Finally, "beef farmer" instead of "beef producer" was used in the Irish version as that is a more common term in Ireland.

Although one fear of the original questionnaire was its length, this was not so much an issue among the participants of the pilot process. Most of them, including the beef producers in the first round, indicated an average participation time of just over 15 minutes. However, by condensing directions and statements and by converting the questionnaire to an online format as the pilot process was done on paper, the length of the questionnaire is further reduced and therefore not expected to be an issue for response rates.

Table 5.3: Comparison of market intelligence statements before and after pretesting

	Statements Canadian questionnaire before pilot process	Statements Canadian questionnaire after pilot process
Intelligence generation	The beef industry polls end consumers at least once a year to assess the quality of our products and services	The Canadian beef industry surveys end consumers at least once a year to assess the perceived quality of Canadian beef products
	In the beef industry, market intelligence on competitors is generated independently by several organizations	Within the Canadian beef industry, market intelligence on competitors (e.g., other meat producing sectors (e.g., poultry), other beef producing countries) is generated independently by several organizations
	* The industry does not periodically review the likely effect of changes in our business environment (e.g., regulations) on consumers	* The Canadian beef industry does not periodically review the likely effect of changes in its business environment (e.g., regulations) on consumers
	In this industry, general macroeconomic information (e.g., exchange rate, inflation rate) is frequently collected and evaluated	Within the Canadian beef industry, general macroeconomic information (e.g., exchange rate, inflation rate) is frequently collected and evaluated
	* In this industry, information regarding general social trends (e.g., environmental consciousness, emerging lifestyles) that might affect our business is not collected and evaluated	* Within the Canadian beef industry, information regarding general social trends (e.g., environmental consciousness, emerging lifestyles) that might affect its business is not collected and evaluated
	In this industry, time is spent with each other to learn more about various aspects of one another's business	Within the Canadian beef industry, time is spent with each other to learn more about various aspects of one another's business
Intelligence dissemination	* Marketing personnel in the beef industry does not spend time discussing consumers' future needs with producers	* Marketing personnel in the Canadian beef industry do not spend time discussing consumers' future demands with producers
	The industry periodically circulates documents (e.g., reports, newsletters) that provide business information on our consumers	Within the Canadian beef industry, business information (e.g., reports, newsletters) relating to its consumers is periodically circulated among each other
	* The industry does not have cross-functional meetings very often to discuss market trends and developments (e.g., about consumers, competitors, suppliers)	* The Canadian beef industry does not have industry-wide meetings very often to discuss market trends and developments (e.g., about consumers, competitors, suppliers)
	Technical people in this industry spend a lot of time sharing information about technology for new products with producers	Researchers in the Canadian beef industry spend a lot of time sharing information about new production technologies with producers

	* Market information does not spread quickly through all levels in this industry	* Market information does not spread quickly through all organizations in the Canadian beef industry
Intelligence responsiveness	* For one reason or another, the beef industry tends to ignore changes in our consumers' product or service needs	* The Canadian beef industry tends to ignore changes in its consumers' product demands
	* The products the industry sells depend more on internal politics than real market needs	* The products the Canadian beef industry sells are more driven by supply than real market demands
	* The industry is slow to adopt practices and develop new products, even though it thinks they are better than existing ones	* The Canadian beef industry is slow to adopt new practices and develop new products
	If a major competitor were to launch an intensive campaign targeted at our consumers, the industry would implement a response immediately	If a major competitor (e.g., another beef producing country, another meat producing sector) were to launch an intensive campaign targeted at its consumers, the Canadian beef industry would implement a response immediately
	* Even if the industry came up with a great marketing plan, it probably would not be able to implement it in a timely fashion	* If the Canadian beef industry came up with a great marketing plan following a competitor's threat, it probably would not be able to implement it in a timely fashion
	* The beef industry tends to take longer than our competitors to respond to a change in regulatory policy	* The Canadian beef industry tends to take longer than its competitors (e.g., other meat producing sectors, other beef producing countries) to respond to a change in agricultural, environmental and trade policy
General market orientation	Given the definition of market orientation above, I think the Canadian beef industry is market oriented	The Canadian beef industry currently makes use of market intelligence to improve its competitive position
	An industry-wide market orientation is necessary to have a competitive industry and to move forward into the future	The Canadian beef industry needs to make use of market intelligence in the future in order to deal with market challenges
	* An increased intensity of competition from other countries is not a basis to have an industry-wide market orientation	-
	An industry-wide market orientation is necessary because of an increased negative public image of the beef sector	-
	Information is not a crucial element for having a competitive industry	-

| | I see clear results of responding to market intelligence at the farm level, e.g., on my own operation by changing production practices and processes | - |
| | I see clear results of responding to market intelligence at the industry level, e.g. of industry efforts that aim to improve the overall competitiveness | - |

* indicates reversed statement

Table 5.4: Comparison of psychometric statements before and after pretesting

Statements as used by Nuthall (2010)	Adapted statements prior to pilot process	Adapted statements post pilot process "To me, good business decision-making …"
I'm using exactly the same production methods that I have for many years as they have stood the test of time	I am using exactly the same production methods that I have used for many years as they have stood the test of time	… means keeping with the same production methods that have stood the test of time
When things go wrong it is so often due to events beyond my control – the weather ruins the hay, the wool auction I choose has a sudden price dip, etc.	My day-to-day decisions are colored by my emotions because of what happens in my immediate business environment, e.g. weather, machinery breaks down	… is impacted by what is going on at the time on the farm, e.g. weather, machinery breakdowns
Often I get frustrated as circumstances beyond my control impede the smooth progress of my management plans		
A belief in being able to control a lot of what happens around the property in contrast to a belief that not much is really controllable due to the weather, markets, government actions, etc. is an important entrepreneurial skill		
Being prepared to give it a go and take risks in changing production systems and/or starting new ventures	Change means opportunity	… means being prepared to give it a go and take risks in changing production systems, technologies, marketing approaches
Being able to seek out, identify, and clarify new opportunities (production, products, marketing, etc.)		

You generally choose conclusions from experience rather than from hunches when they are in conflict	In times of business challenges, I rely on experience rather than external information	… means that in times of business challenges I rely on experience rather than external information
Understanding sources of risk and what can be done to reduce their impact is an important entrepreneurial skill	Understanding sources of risk and what can be done to reduce their impact is key to good decision-making	… means understanding sources of risk and what can be done to reduce their impact
The ability to learn from experience, mistakes, and failures is an important personal attribute	I am not afraid to reflect critically on the beliefs and assumptions we have about the way we farm	… means being able to learn from experience, mistakes and failures
You find investigating new farming/growing methods exhilarating and challenging	Original ideas are highly valued in running my operation	… means investigating new production or farming methods
Being up-to-date with the current condition of the property in its totality bank balances, animal condition, crop growth, soil moisture, feed levels, machinery repair, etc.) is an important managerial attribute	Being up-to-date with the current condition of the operation in its totality (e.g. bank balances, animal condition, crop growth, soil moisture, feed levels, machinery repair) is key to good decision-making	… means being up-to-date with the current condition of the operation in its totality (e.g. bank balances, animal performance, crop growth, soil moisture, feed levels, machinery repair)
The ability to predict product prices into the foreseeable future, or at least understanding the factors that determine the prices, and understand market requirements is an important managerial attribute	The ability to predict product prices into the foreseeable future, or at least understanding the factors that determine the prices, and understand market requirements is key to good decision-making	… means being able to predict product prices into the foreseeable future, or at least understanding the factors that determine the prices, and understand market requirements
An ability to look ahead and anticipate likely problems, needs, opportunities is an important entrepreneurial skill	An ability to look ahead and anticipate any likely problems, needs, opportunities is key to good decision-making	… means being able to look ahead and anticipate any likely problems, needs and opportunities

5.4   Survey implementation

This research project, including the questionnaire, received research ethics approval from the University of Alberta Research Ethics Board, project name "The use of market intelligence and decision-making as a driver of industry competitiveness: A producer's perspective on the Western Canadian and Irish beef industries", no. Pro00071243, on March 22, 2017. The questionnaire was converted to an online survey tool using the software Remark Web Surveys, and this was conducted by Test Scoring & Questionnaire Services (TSQS) as part of the Information Services & Technology (IST) department of the University of Alberta. To increase convenience for respondents, a progress bar was provided at the bottom of each page. A warning was given when key questions were not answered, which was applied to Section A, B, and C. If respondents decided to leave the survey after Section C, answers would still be recorded for the previous questions. An example of the look of the online survey is given in Figure 5.3.

Figure 5.3: Sample of survey questions

Beef producers in Western Canada and Ireland are the target audience for this online survey, where Western Canada is defined as the provinces British Columbia, Alberta, Saskatchewan, and Manitoba. There was no differentiation between producers based on gender, age (although it was assumed beef producers would be 18 or older due to responsibility for decision-making) or output level of operations, and all producers, even so-called "hobby producers" or producers who are mainly dairy producers but raise calves for beef production, within these geographical areas

belonged to the target audience. The reason for this is that these producers are part of the overall beef industry and therefore their perception of how market intelligence is utilized within their industry matters. Additionally, including these producers would also facilitate more responses, as it was expected that engaging beef producers in an online survey would be difficult in general due to the traditional nature of the sector. This would also increase the probability of having a representative sample. Finally, it is important to have both conventional beef producers and those adhering to certain production systems or quality assurance schemes in the sample, as the decision-making processes of these types of producers will likely differ, in turn affecting the level of market orientation of their industry. Examples of different decision-making processes for these producers include the strategic direction of their operation, where to market their cattle, and their willingness to investigate new production or marketing approaches.

Even though the aim is to make statistical inferences from the data regarding the use of market intelligence, a non-probability sampling technique is used in this thesis as there was no list of the total population consisting of individual beef producers was available due to confidentiality. The probability of each individual is to be chosen from the overall population as a research participant is unknown with a non-probability sampling technique. However, there is a risk of not ending up with a representative sample using this strategy and therefore not being able to make statistical inferences. If the sample size is sufficiently large, generalizations about the overall population are possible but not based on statistics. A non-probability sampling technique is considered useful because of its practicality, when limited resources are available to attract potential respondents and to support the exploratory nature of a research project, resulting in an ambiguous sample size (Saunders et al., 2009). The sampling technique for Canada can be further characterized as both snowball and self-selection, as organizations to contact were based on references from other organizations and ultimately data was collected from those beef producers that desired to participate in the survey. A self-selection sampling technique is considered useful in exploratory research and when no sampling frame is available, and results in low relative costs of administering the survey, a low degree of control over the sample contents and a possible low likelihood of having a representative sample (Saunders et al., 2009).

As all beef producers in Canada pay a mandatory marketing levy per head of cattle marketed that is collected by the provincial beef cattle organizations, all beef producers in Canada are registered with their respective beef cattle organization. Therefore, these organizations provide a valuable connection to individual beef producers, in addition to other industry organizations, provincial

governments and existing professional networks. As access to organizations with the goal of collecting primary data can be difficult and is an ongoing process (Saunders et al., 2009), relationships to gain acceptance and confidence were established early on in the research process and maintained throughout. Gatekeepers were identified for several organizations and geographical areas, who assisted in promoting the research project and demonstrating the potential value of this thesis to beef producers and introduced other valuable persons and organizations in recruiting beef producers. Furthermore, a project description was sent out to these additional persons and organizations, as well as handed out to attendees of the FAA AGM in February 2017. A presentation about the value of this research project was given to the younger cohort at FAA AGM 2017, and an advertisement to be distributed on social media among beef producers in Saskatchewan was created.

The sampling technique for Ireland can also be characterized as non-probability sampling and self-selection, whereby a gatekeeper for Teagasc was identified to assist in promoting and distributing the survey link among Teagasc advisors, Teagasc's Communications Department and Irish farm media using a shortened project description.

Following the establishment of relationships with beef producers and industry partners, the link to the survey was sent out in a mass email to these contacts in Canada, accompanied by an invitation letter. This letter summarized the benefits of participating in the survey, the objectives of the research and contact details, and also stated the deadline for returning the questionnaire as this generally increases the response rate (Pennings et al., 2002). Follow-up reminder letters or new mass emails to additional generated contacts were sent based on the development of the response rate, generally after 8 business days for each contact.

As timing is important for the response rate when surveying agricultural producers, the aim was to distribute the online survey tool in both Canada and Ireland after seeding of crops and calving in the Spring of 2017, even though the months May-October are not preferred by many producers (Pennings et al., 2002). However, due to delays in getting ethics approval and converting the paper-based questionnaire to an online tool, this was postponed to the second week of July 2017 for Canada and the beginning of August 2017 for Ireland. Both surveys were closed August 31, 2017, resulting in a time frame of about 6 weeks for Canada and 4 weeks for Ireland.

5.5   Methodology for data analysis

Earlier studies that have studied and measured the level of MO, or tested relationships among market orientation constructs, have used factor analysis, structural equation models and other regression models to test their hypotheses. Factor analysis in particular has been used to validate the measurement scales for MO or other latent variables as it reduces the data to factors representing the latent variables for which specific structures can be explored, imposed or tested. As the measurement scale used in this thesis is significantly altered, it cannot be automatically assumed that the adapted scale is reliable and valid to generate results. Therefore, a scale validation procedure is performed to measure the consistency of the scale with the ones developed in the literature and to be able to draw reasonable conclusions from this thesis. Such a procedure typically consists of estimating reliability, internal validity and performing factor analysis.

Scale reliability measures whether the questionnaire is able to measure items consistently and is therefore used to evaluate the trustworthiness of measurement scales by estimating correlations between individual items and the latent variable. Cronbach's alpha is typically used to measure scale reliability, for which a value of 0.70 or higher is considered adequate (Cronbach, 1951).

In Chapter 4 a conceptual model was developed to represent the determinants of MO at the agricultural industry level. This conceptual model was applied to the context of the beef industries in Western Canada and Ireland. The structure of the conceptual model is therefore unique to these contexts and different from previous studies (e.g., Min et al., 2007). As a result, there is no strong prior belief about the structure of the model based on the literature. This thesis therefore makes use of Exploratory Factor Analysis (EFA) to understand the pattern of association among (latent) variables instead of Confirmatory Factor Analysis (CFA) that is usually performed to test a proposed factor structure.

The broader methodology that can be applied to test the relationships between MO and the market intelligence concepts is called Structural Equation Modeling (SEM) and includes factor analysis. SEM is a general approach to estimate simultaneously the measurement errors involved with the observed variables on the one hand (i.e., measurement model), and the relationships between the latent variables on the other hand (i.e., path or structural model) (Lattin et al., 2003). The measurement model describes the relationships between the observed variables (i.e., the actual survey questions) and the latent variables (i.e., market orientation (MO), intelligence generation (IG), intelligence dissemination (ID), intelligence responsiveness (IR)). As such, the

measurement model in this thesis describes which survey questions reflect which MO or market intelligence construct. Measurement error for this model could be caused by omitted (observed) variables or by poor operationalization of the latent variables.

The structural model describes the dependence among the latent variables, such as presented in Figure 4.4 for the market orientation and market intelligence constructs in the context of this thesis. As such, this thesis will employ SEM to test the significance of relationships between the latent variables.

There are two ways of conducting SEM, namely covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM), which differ in the underlying statistical assumptions and approaches. CB-SEM produces the variance-covariance matrix of the observed variables by aiming to minimize the differences between the actual and modeled variance-covariance matrices. It thereby assumes data to be normally distributed and a minimum sample size of the number of parameters to be estimated times ten.

In contrast, PLS-SEM aims to minimize the residual of variances of the latent variables, under the assumption that these variances are explained using the variances of observed variables. It thereby is less restrictive in assuming data to be normally distributed (Hair et al., 2011).

As this thesis employs survey data as opposed to e.g. experimental data in investigating opinions, the likelihood that data is non-normal is relatively high. As such, to manage the likely non-normality of the data, this thesis will use PLS-SEM to estimate determinants and dependences among determinants for the level of market orientation of the Canadian and Irish beef industries.

Chapter 6: Data

This chapter gives an overview of the data received following the distribution of the survey. Section 6.1 and 6.2 present some key statistics describing the samples for Canada and Ireland, respectively. Section 6.3 ends this chapter with discussing whether the empirical strategy outlined in Chapter 5 is still relevant given the obtained data.

6.1   Descriptive statistics for Canada

A total of 39 respondents participated in the survey in Canada, for which the descriptive statistics regarding some structural variables can be found in Table 6.1. Other categorical structural variables are discussed in more detail below.

The respondents were either located in Alberta (35 producers) and Saskatchewan (4 producers), as no beef producers from Manitoba or British Columbia participated in the survey. The majority of respondents had a cow-calf segment on their operation (82%), followed by backgrounding (43.5%) and finally breeding and finishing (both 25.5%), respectively, and one-third of respondents indicated producing beef cattle on a mixed farm. Of the beef cattle operations in Alberta, 40% had a cow-calf enterprise only, 17% had both a cow-calf and a backgrounding enterprise, and 17% had all three enterprises (i.e., cow-calf, backgrounding, feedlot) present on the operation. For Saskatchewan, these numbers were 50%, 25% and 25%, respectively.

The average herd size in 2016 was 700 beef cows, ranging from a minimum of 14 to a maximum of 15,000 cows. However, as shown in Figure 6.1, 22% of operations had less than 50 beef cows and 38% had less than 100 beef cows present on the operation.
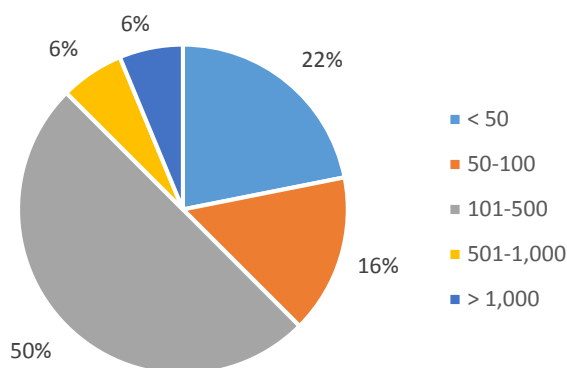
Figure 6.1: Distribution of 2016 herd size (%) - Canada

Table 6.1: Summary statistics Canada

Variables	Description	Mean	Standard deviation	Minimum	Maximum
beefcows (N = 34)	average # of beef cows in 2016	700.3	2,596.5	14	15,000
acres (N = 38)	total area farmed for all enterprises	3,820	7,214.6	30	30,000
years (N = 36)	# of years respondent is decision-maker for beef operation	26.3	14.9	0	50
Dummy variables (1 = yes)	Description	Number and proportion (%) of affirmative response			
mixed	Producing beef cattle on a mixed operation	13			33.3
primary_decision	Respondent is the primary decision-maker	35			89.7
operation_cowcalf	Cow-calf enterprise is part of operation	32			82.1
operation_backgrounding	Backgrounding enterprise is part of operation	17			43.6
operation_breeding	Breeding or seedstock production is part of operation	10			25.6
operation_finishing	Finishing or feedlot is part of operation	10			25.6
gender	Respondent is male	32			82.1
fulltime	Respondent is farming full-time	24			63.1

About 90% of respondents indicated to be the primary decision-maker for the operation, with an average of about 26 years of experience in decision-making. Figure 6.2 gives more insight into the number of years respondents are involved in decision-making, where 14% are considered to be relatively new entrants with under 10 years of experience in decision-making. Similarly, 49% of respondents are seasoned decision-makers with over 30 years of experience. It is apparent that this sample consists of both new entrants and veterans, while the middle segment is somewhat underrepresented.
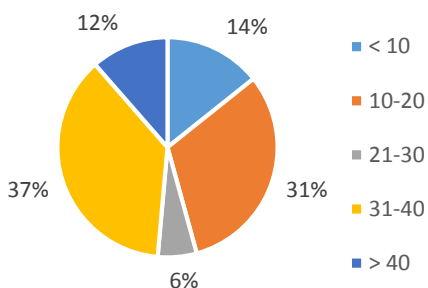
Figure 6.2: Distribution of experience in decision-making for beef cattle operation (%) - Canada

The largest number of respondents indicated to be either 36-40 or 61-65 years old (both N = 6), with one respondent being over 75 years old and no respondents younger than 20 years old. Furthermore, 15% of the respondents was younger than 35 and 57% of the respondents was older than 55.

The largest number of respondents were a member of Alberta Beef Producers (ABP) (N = 25), followed by a crop or forage association (N = 9), and Alberta Cattle Feeders Association (ACFA), Feeders Association of Alberta (FAA) and a national or provincial breed association (N = 8). One respondent also indicated to be part of Alberta Young Farmers & Ranchers (AYFR).

Figure 6.3 shows the production systems represented in this sample, from which it can be seen that a conventional production system was the most common among the survey respondents. 46% of the respondents also indicated to adhere to the directions of Verified Beef Production (Plus), an on-farm food safety and sustainability program. Two respondents indicated to be following a different production system, namely a health program and a natural beef production system, respectively.
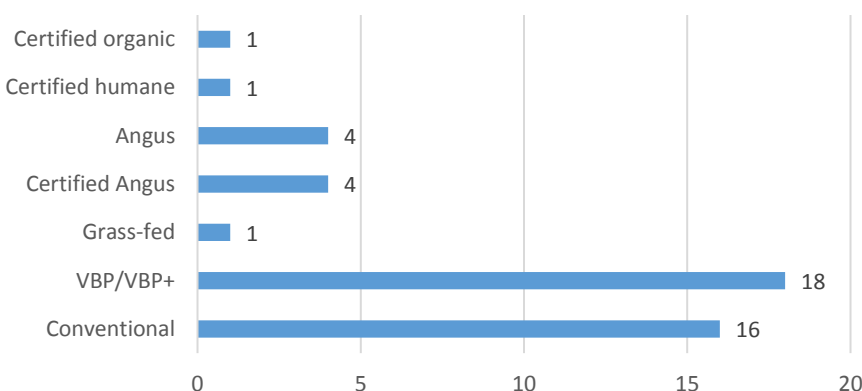
Figure 6.3: Distribution of adhered production systems (N) - Canada

97

Almost all respondents (92.3%) said they are producing for the domestic market, with 59% producing for the export market and 38% for own consumption and that of community members. Finally, the most common education levels among respondents are a university or bachelor's degree (N = 11) and high school (N = 9), while a college degree and a trade or technical education are prevalent too.

The sample obtained for Canada is not representative for the Western Canadian beef industry for several reasons. First, not all four Western provinces were represented in the sample, and the distribution of beef enterprises (i.e., cow-calf, backgrounding, feedlot) of the provinces that were represented did not match the true statistics for these provinces (86.7%, 6.2% and 6.2%, respectively, for Alberta and 93%, 6% and 0.1%, respectively, for Saskatchewan) (AAFC, 2017a). Second, of the cow-calf operations in the sample one-third was a mixed farm, which does not align with the 56% reported in the Western Canadian Cow-Calf Survey (WCCCS) (WBCD, 2015). Third, the total number of beef cows in this sample represents only 23,800 or 0.76% of the 3.14 million beef cows to be in Western Canada at the beginning of 2017 (Statistics Canada, 2017h). Similarly, these numbers are only 1.34% of the 1.43 million beef cows in Alberta and 0.41% of the 1.1 million beef cows in Saskatchewan (Statistics Canada, 2017h).
Fourth, 63% of the respondents indicated to be farming full-time, meaning that the proportion relying on off-farm income in this sample (37%, if assumed farming part-time implies having an off-farm income) is much lower than the 60% of beef cattle operations in Western Canada estimated by Statistics Canada (Statistics Canada, 2017e).

However, even though the sample obtained for Western Canada is not representative for the Western Canadian beef industry, it still possesses some characteristics that could be helpful in explaining differences in opinions of the use market intelligence in this industry. These characteristics are, for example, its focus on the cow-calf segment, its relatively small size in terms of beef cows present on operations, and its relatively experienced and older beef producers. These elements and their effect on key survey results are further explored in the next chapter.

6.2   Descriptive statistics for Ireland

A total of 30 respondents participated in the survey in Ireland, for which the descriptive statistics regarding some structural variables can be found in Table 6.2. Other categorical structural variables are discussed in more detail below.

As can be seen from Figure 6.4 almost all respondents were located in the (north) western part of Ireland (e.g., regions West, Border and Midland), where beef production is most prevalent (cf. Figure 2.5).
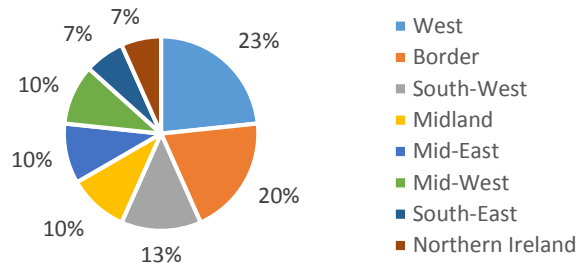
Figure 6.4: Distribution of regions (%) - Ireland

Table 6.2: Summary statistics Ireland

Variables	Description	Mean	Standard deviation	Minimum	Maximum
beefcows (N = 22)	average # of beef cows in 2016	26.5	15.6	0	60
hectares (N = 28)	total area farmed for all enterprises	43.2	22.7	11	102
years (N = 29)	# of years respondent is decision-maker for beef operation	8.8	10.4	1	46
Dummy variables (1 = yes)	Description	Number and proportion of affirmative response (%)			
mixed	Producing beef cattle on a mixed operation	8		26.7	
primary_decision	Respondent is the primary decision-maker	21		70.0	
operation_suckler	Suckler enterprise is part of operation	20		66.7	
operation_store	Store enterprise is part of operation	12		40.0	
operation_breeding	Breeding enterprise is part of operation	7		23.3	
operation_finishing	Finishing enterprise is part of operation	15		50.0	
operation_dairy	Dairy enterprise is part of operation	10		30.0	
gender	Respondent is male	26		86.7	
fulltime	Respondent is farming full-time	4		13.3	

The majority of respondents had a suckling segment on their operation (66.7%), followed by finishing (50%) and finally a store segment and dairy (40% and 30%, respectively), and about 27% of respondents indicated producing beef cattle on a mixed farm. Furthermore, 24% of the survey respondents had a suckling enterprise on their operation, while 29% and 33% had a suckling-to-store operation and suckling-to-finish operation, respectively.

The average herd size in 2016 was 27 beef cows, ranging from a minimum of 0 to a maximum of 60 cows. As shown in Figure 6.5, 29% had less than 15 cows on its operation and a total of 43% had less than 24 cows on its operation.
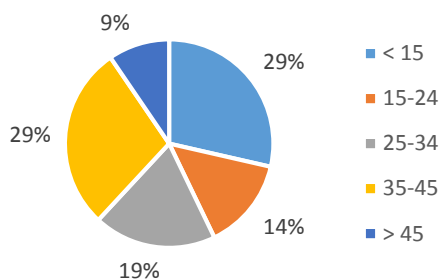
Figure 6.5: Distribution of 2016 herd size (%), N = 21 - Ireland

70% of the respondents indicated to be the primary decision-maker for the operation, with an average of about 8.5 years of experience in decision-making. It is remarkable that, given the average age of Irish beef farmers discussed in Chapter 2, 80% of this sample has less than 10 years of experience in making decisions for the beef cattle operation as shown in Figure 6.6.
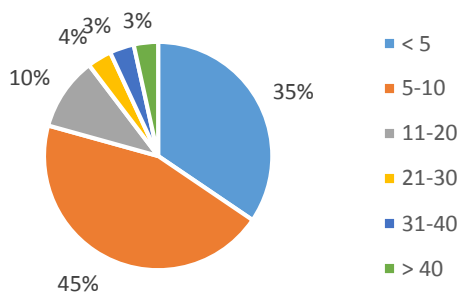
Figure 6.6: Distribution of years of experience in decision-making for beef cattle operation (%), N = 29 - Ireland

The largest number of respondents indicated to be 36-40 years old (N = 9), with one respondent being 61-65 years old and 5 respondents being 21-25 years old. As such, 81% of the respondents in this sample was younger than 40.

The largest number of respondents were a member of or involved with the Irish Farmers' Association (IFA) (N = 18) and the Beef Data & Genomics Programme (BDGP) (N = 17), followed by the Knowledge Transfer Beef Programme (N = 15).

Figure 6.7 shows the production systems represented in this sample, from which it can be seen that most operations were either involved in a grass-fed or conventional production system. The majority of beef farmers also indicated to adhere to the Bord Bia Beef Quality Assurance Scheme.
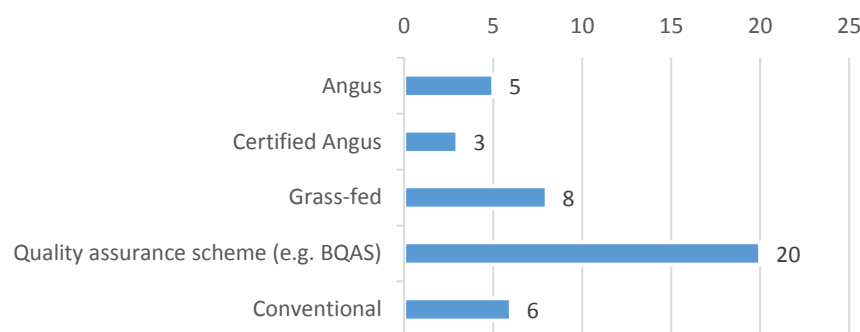
Figure 6.7: Distribution of adhered productions systems (N) - Ireland

The majority of respondents (83.3%) said they are producing for the domestic market, with 40% producing for the export market. Finally, the most common education levels among respondents are a bachelor's degree (N = 12) and a post-graduate degree (N = 8), followed by an advanced certificate or completed apprenticeship (N = 7).

The sample obtained for Ireland is not representative for the Irish beef industry for several reasons. First, the numbers regarding different types of suckling operations do not coincide with results from the 2015 National Farm Survey (NFS), where 14% had a suckling-to-weanling operation, 14% a suckling-to-store operation, 10% a suckling-to-finishing operation, 21% a dairy enterprise on their operation, and 20% a mixed operation, respectively (Hennessy and Moran, 2016a).

Second, the total number of beef cows in this sample represents only 580 or 0.02% of the 2.35 million suckling cows (including dairy cows) to be in Ireland at the end of 2016 (CSO, 2017a). Third, the average size in hectares of operations in this sample (i.e., 43 hectares) does not coincide

with the average of 62 hectares reported in Murphy and Meredith (2015) in their typology of Irish of beef farms.

Fourth, Murphy and Meredith (2015) reported an average of 55.6 years for Irish beef farmers and Hennessy and Moran (2016b) reported an average age of beef farmers on a Cattle Rearing operation and Cattle Other operation in 2015 of 56.8 and 58.7 years, respectively, while 81% of this sample was under 40.

Fifth, 13% of the respondents indicated to be farming full-time, meaning that the proportion relying on off-farm income in this sample (87%, if assumed farming part-time implies having an off-farm income) is much higher than its equivalent reported by DAFM (2017a), i.e. 46%, and is also much higher than the proportion of Cattle Rearing and Cattle Other operations reporting having an off-farm income in 2015 (59.4% and 49.5%, respectively) (Hennessy and Moran, 2016b).

However, even though the sample obtained for Ireland is not representative for the Irish beef industry, like the Canadian sample it still possesses some characteristics that could be helpful in explaining differences in opinions of the use market intelligence in the Irish beef industry. These characteristics are, for example, its concentration in the northwestern part of Ireland, its relatively inexperienced and young beef farmers, and its relatively high degree of part-time beef farming. These elements and their effects on key survey results are further explored in Chapter 7.

6.3   Alternative empirical strategy

Following the empirical strategy outlined in Chapter 5, a scale validation procedure was conducted as the first step of Structural Equation Modeling (SEM). The four latent variables (i.e., market orientation (MO), intelligence generation (IG), intelligence dissemination (ID), intelligence responsiveness (IR)) for both Canada and Ireland are measured reasonably consistent based on the data, as shown in Table 6.3. Generally, the values of Cronbach's alpha exceed 0.70, except for the IG latent variable.

Table 6.3: Scale reliability statistics, Cronbach's α

	Canada	Ireland
MO	0.8819	0.8457
IG	0.6649	0.6558
ID	0.7551	0.7748
IR	0.7871	0.8488

However, when examining correlations, it was found that items were significantly correlated with other items outside of their respective latent variable, indicating the unique contribution of individual questions to the latent variables was limited. Furthermore, an exploratory factor analysis yielded inconclusive factor loadings and resulted in a total of five factors for the Canadian sample and six factors for the Irish sample. As such, the number of factors for both samples did not align with the four factors identified in the conceptual model of this thesis.

These results have to be viewed in light of the small number of observations for both countries (N = 39 for Canada and N = 30 for Ireland, respectively), thereby limiting the reliability of the adapted MO scale as a measurement indicator to quantify the level of market orientation of agricultural industries. Therefore, the value of testing the hypotheses outlined in Section 4.3 is restricted and insubstantial. A more exploratory approach instead is being chosen as an alternative empirical strategy, which also fits within the broader case study method of this thesis. The data are first tested to be normally distributed, after which some t-tests and comparisons are conducted to investigate important differences between the Canadian and Irish beef industries and their respective use of market intelligence.

Chapter 7: Results

This chapter presents the results following an exploratory and comparative analysis of the data obtained from the survey. It thereby aims to give an answer to the fourth research question, i.e. "What are similarities and differences between the Canadian and Irish beef industries when making use of market intelligence?" Section 7.1 presents results for Canada and Ireland regarding the influence of external market factors, while Section 7.2 and 7.3 compare results for the two beef industries regarding the use of information sources and producer decision-making characteristics. Section 7.4 then ends this chapter by presenting an overview of the results for the market orientation and market intelligence aspects[18].

7.1   External market factors

Figure 7.1 presents the external market factors and the average score for both Canadian and Irish beef producers, while standard deviations and t-values indicating significance compared to the neutral category of the 7-point Likert scale can be found in Table C.1.

External market factors[a]

Demand for farm animal welfare is a threat	3.7 / 3.8
Demand for a certain attribute is an opportunity	5.6 / 5.5
Demand for grass-fed/pasture-fed is a threat	2.9
Demand for grass-fed/pasture-fed is an opportunity	6.4
Demand for beef from a certain breed is an opportunity	4.8 / 5.2
Demand for organic beef is an opportunity	4.0 / 4.4
Climate change is a threat	3.7 / 5.6
US market trends and regulations are a threat	4.9
Brexit and the future of EU direct payments are a threat	6.2
Federal and provincial regulations are a threat	4.7
Export and trade agreements are an opportunity	5.7 / 5.9

■ Canada ■ Ireland

[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

Figure 7.1: Comparative results external market factors

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[18] Although this chapter presents the results of this thesis using bar charts only, the distributions of answers using histograms and other specifications using structural variables have also been examined to be able to provide a more complete picture for some of the items.

From Figure 7.1 it can be seen that Canadian beef producers perceive export and trade agreements as the most important opportunity for the Canadian beef industry, while Irish beef producers indicated that consumer demand for grass-fed or pasture-fed beef products is the most important opportunity to their industry. On the other hand, both samples agreed that market trends and regulations concerning their major trading partner is the biggest threat to the respective industries; Canadian producers declared this for US market trends and regulations, and Irish beef producers agreed on this for Brexit and the future of EU direct payments and other EU regulations. However, the Irish producers indicated this to be a threat of a much greater extent than the Canadian producers. A noteworthy difference between the Irish and Canadian beef producers is the perception of the effects of climate change on their industry. Whereas Canadian producers only agreed to a mediocre effect, Irish beef producers perceive a strong influence of the effects of climate change on their industry.

7.2   Use of information sources

Figures 7.2 – 7.5[19] show which information sources and their frequencies are used by the Canadian and Irish beef producers for their marketing and strategic decisions, respectively, as these decision situations are most relevant to market orientation and the use of market intelligence on the farm level. However, additional figures are presented for buying and operational decisions of these producers in the Appendix C.

In terms of output or market decisions, family members and price and market reports were used most frequently by Canadian beef producers, while social media was the least popular for this kind of decision. Farm print media, non-family partners, and financial records were used less frequently, and extension or research outcomes and producer meetings were used rarely by the majority of Canadian producers. The Irish producers however, seemed to rely more frequently on social media and family members for their marketing decisions, while indicating to use the other information sources on a less frequent basis (but still weekly or monthly). Advisors (other than Teagasc advisors) were the least popular for this kind of decision situation.

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[19] Note: frequent = daily or multiple times a week; less frequent = weekly or monthly; rarely = a few times per year or annually
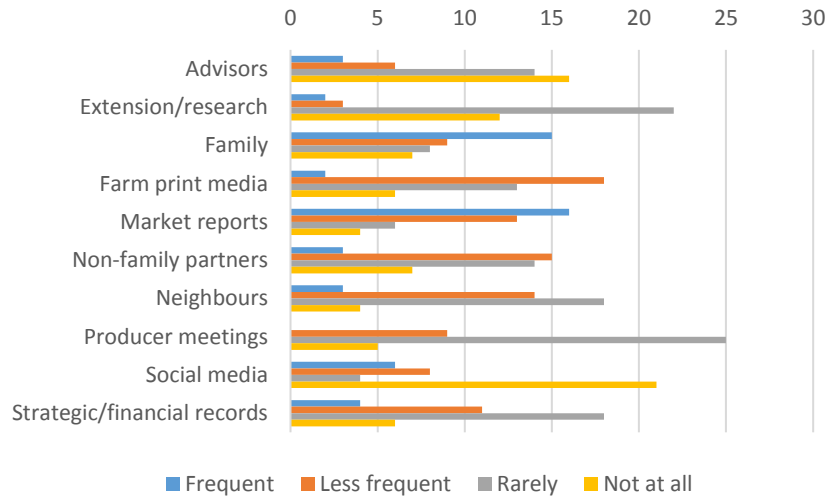
Figure 7.2: Use of information sources for marketing decisions - Canada
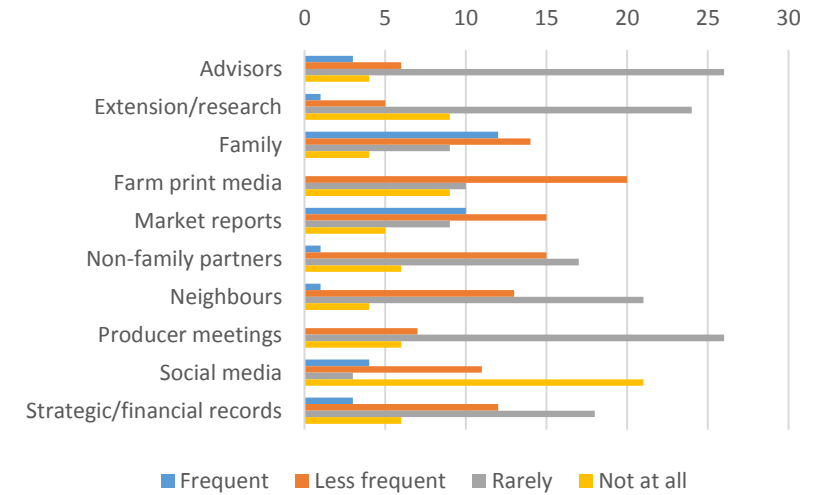
Figure 7.3: Use of information sources for strategic decisions - Canada
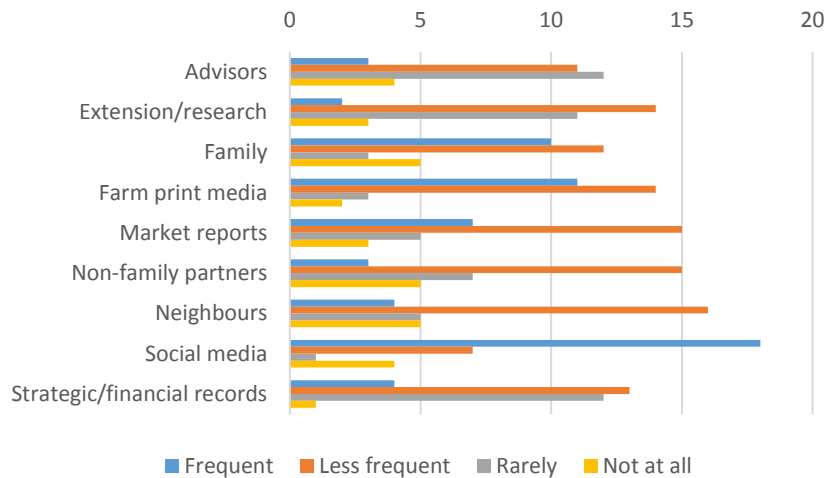
Figure 7.4: Use of information sources for marketing decisions - Ireland
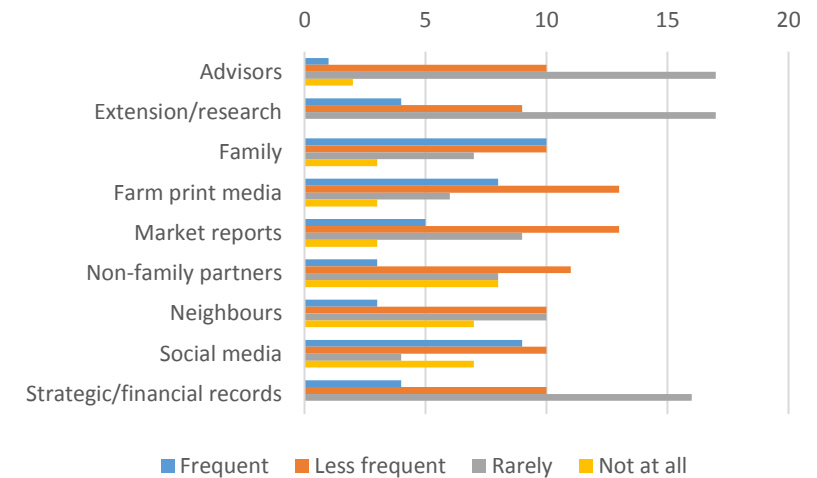
Figure 7.5: Use of information sources for strategic decisions - Ireland

Strategic or more long-term decisions are also most frequently guided by family members and market or price reports in Canada. Social media again was the least popular, while producer meetings, advisors and extension or research outcomes were consulted annually or a few times per year. Again, the Irish producers seem to rely on all information sources more frequently for their strategic decisions, with social media, family members and farm print media in particular. Advisors, extension or research outcomes and financial records were also the least consulted for strategic decisions in Ireland.

7.3   Producer decision-making

Figure 7.6 presents the results for the decision-making items, while standard deviations and t-values indicating significance compared to the neutral category of the 7-point Likert scale are presented in Table C.2.

Producer decision-making[a]
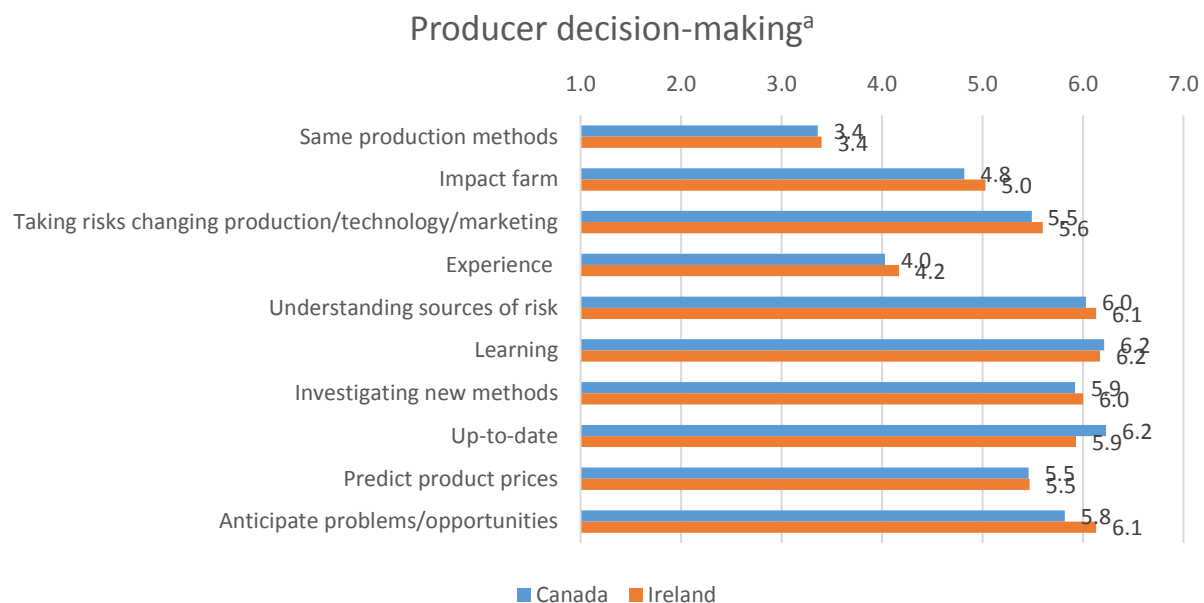
[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

Figure 7.6: Comparative results producer decision-making

As can be seen from Figure 7.6, results for the producer decision-making characteristics are rather similar for both samples. The Canadian producers agreed most strongly that learning from experience, mistakes and failures, staying up-to-date on all aspects of the farm, and understanding sources of risk are most important for making good business decisions. The Irish

producers also agreed on the importance of learning and keeping up-to-date on what is happening on the farm, but also acknowledged being able to anticipate any problems or opportunities as part of good business decision-making. Both samples agreed that keeping with the same production methods and relying on experience instead of external information is does not contribute to good business decision-making. However, the distributions of responses for this item showed that a large portion of producers in both countries did not agree with this, and thus rely on experience as opposed to external information in times of business challenges. This effect was stronger for the Canadian sample than the Irish sample.

7.4   Use of market intelligence

Figure 7.7 presents the items regarding intelligence generation and the average score for both Canadian and Irish beef producers, while standard deviations and t-values indicating significance compared to the neutral category of the 7-point Likert scale can be found in Table C.3.

Intelligence generation[a]

	Canada	Ireland
IG1: Surveys end consumers	4.4	4.0
IG2: Independent MI generation	5.0	4.5
IG3: Changes business environment on consumers*	3.5	4.3
IG4: Macroeconomic information	5.4	4.4
IG5: Information social trends*	3.7	4.2
IG6: Learning about others' businesses	4.0	3.8
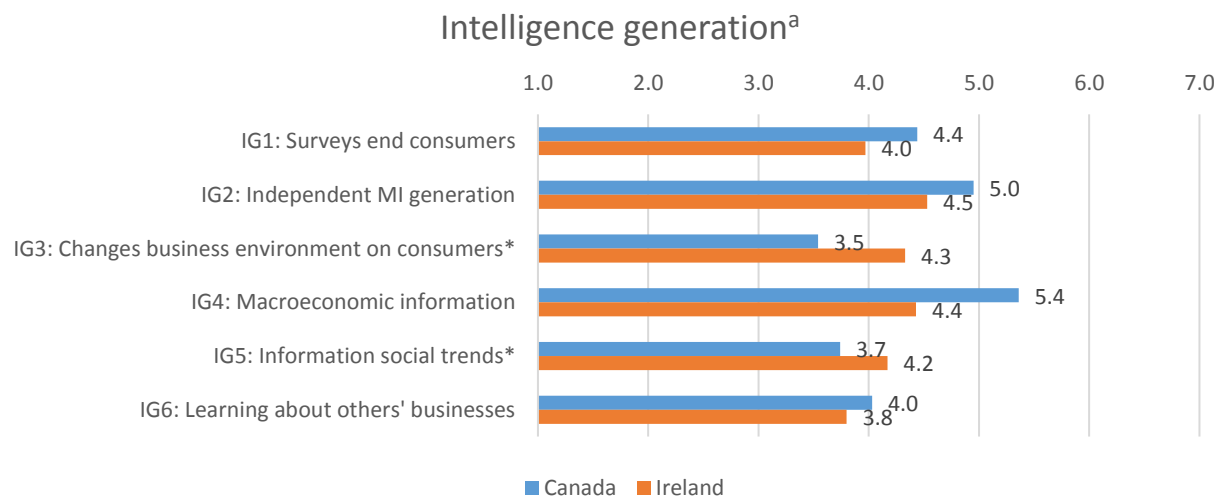
[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

* indicates reversed statement

Figure 7.7: Comparative results intelligence generation

While most of the opinions of both Canadian and Irish beef producers regarding the generation of market intelligence within their industry center around the neutral category, the first four statements were significantly different from the neutral option for the Canadian sample. This means that they agree that information on how consumers perceive the quality of Canadian beef products, information relating to how (business) regulations could affect consumer demand,

information on competitors and information regarding exchange rates and inflation rates are collected within the Canadian beef industry. However, the distributions of responses for the items of changes in the business environment of the industry and the respective effects on consumers, information on social trends, and learning about others' businesses within the industry (i.e., IG3, IG5, IG6) showed that also a relatively large portion of Canadian producers did not agree with these statements.

The Irish beef producers also agreed most strongly that information on competitors is collected within the Irish beef industry by different organizations but were undecided about the generation of all other types of market intelligence (i.e., the distribution of answer categories for these items was approximately even).

One notable difference between the Canadian and Irish sample is that the Irish producers have a stronger perception than the Canadian producers that information concerning regulations and their effect on consumer demand is not collected. Another difference is that the Canadian beef industry seems to make more use of macroeconomic information than the Irish beef industry.

Figure 7.8 presents the items regarding intelligence dissemination and the average score for both Canadian and Irish beef producers, while standard deviations and t-values indicating significance compared to the neutral category of the 7-point Likert scale are presented in Table C.3.

Intelligence dissemination[a]

	1.0	2.0	3.0	4.0	5.0	6.0	7.0
ID1: Consumer demands communicated to producers*	Canada 4.1 / Ireland 5.0						
ID2: Circulation business information	Canada 4.7 / Ireland 3.8						
ID3: Industry-wide meetings*	Canada 3.7 / Ireland 5.2						
ID4: Sharing new production technologies	Canada 4.4 / Ireland 4.7						
ID5: Information spreading organizations	Canada 3.9 / Ireland 5.4						

■ Canada ■ Ireland

[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

* indicates reversed statement

Figure 7.8: Comparative results intelligence dissemination

It is apparent that the Irish sample gave higher scores than Canadian producers to almost all intelligence dissemination items. For the Canadian sample, items ID2 and ID4 were significantly

different from the neutral category, indicating that these producers agree that business information concerning consumers as well as information regarding new production technologies are distributed within their industry. The histogram for item ID1 showed that the Canadian producers were undecided about whether consumer demands are communicated back to them. Similarly, the histogram for item ID3 showed that an equal portion of the producers both agreed and disagreed with the fact that industry meetings are organized regularly to discuss market intelligence.

For the Irish sample all items except ID2 were significantly different from the neutral category. This means that, according to the Irish producers, information regarding new production technologies is shared within the Irish beef industry. However, this also means that these producers are of the opinion that consumer demands are not communicated back to producers, other market trends and developments are not discussed frequently enough and generally market information does not travel quickly within the Irish beef industry. These last three issues also seem to be the biggest differences between the two beef industries in terms of spreading market intelligence.

Figure 7.9 presents the items regarding intelligence responsiveness and the average score for both Canadian and Irish beef producers, while standard deviations and t-values indicating significance compared to the neutral category of the 7-point Likert scale can be found in Table C.3.

Intelligence responsiveness[a]

	Canada	Ireland
IR1: Ignore changes consumer demands*	4.1	4.1
IR2: Supply-driven*	4.0	5.2
IR3: Slow adoption of practices and products*	4.2	4.6
IR4: Immediate response following competitor's threat	3.6	4.2
IR5: Timely implementation following competitor's threat*	4.4	4.2
IR6: Slow response to policy changes*	4.0	4.4
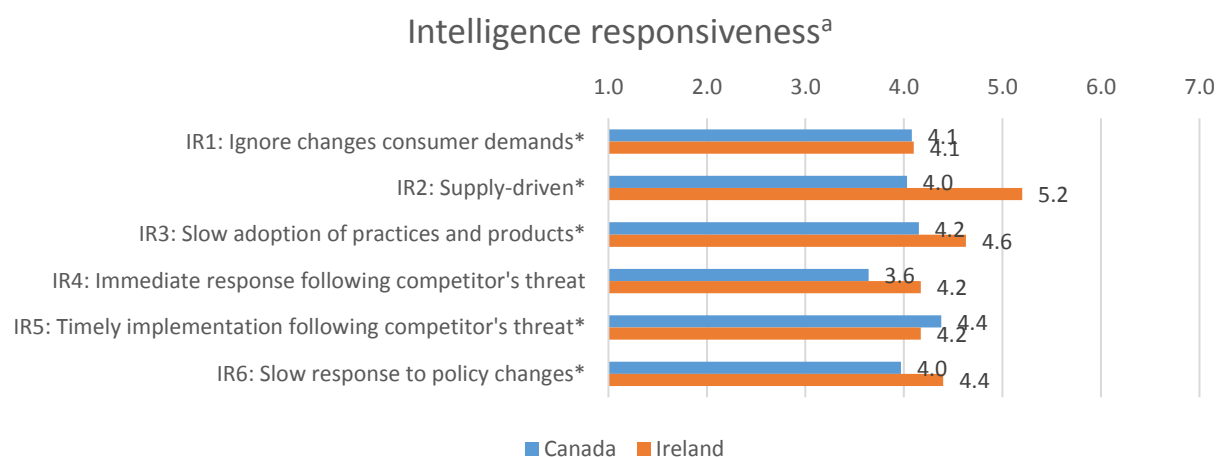
[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

* indicates reversed statement
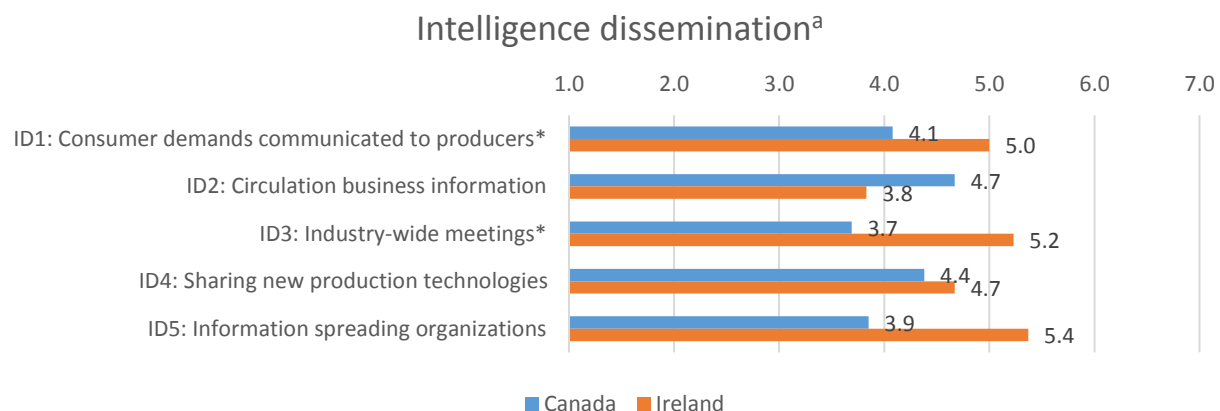
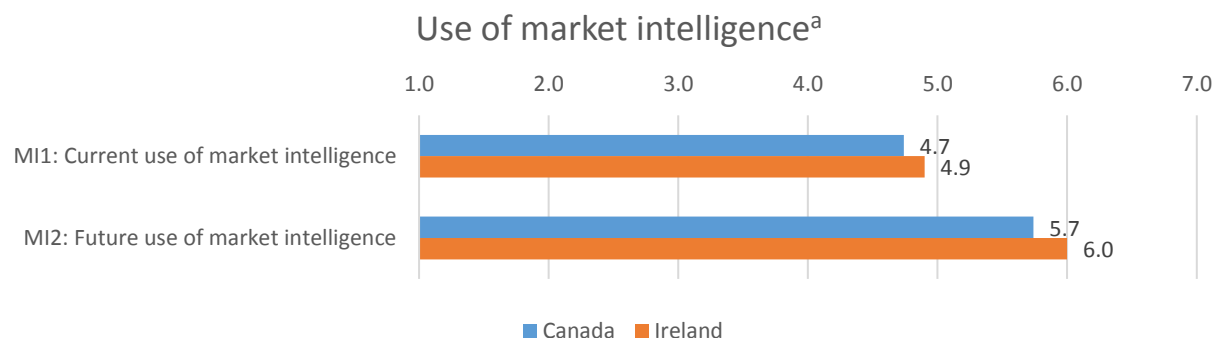Figure 7.9: Comparative results intelligence responsiveness

IR5 was the only item having significance for the Canadian sample, indicating that producers agreed that their industry might be slow in reacting to competitor's actions but also that producers were either indifferent or divided about the degree of responsiveness of the Canadian beef industry. More specifically, an even portion of producers both agreed and disagreed with how quickly new production technologies are adopted and products are developed. Producers' answers regarding whether the flow of beef products is more supply-driven and demand-driven and the speed following changes in agricultural, environmental and trade policy (i.e., IR2 and IR6) fell in all seven categories. However, a closer look at the data (see Figures C.5 and C.6) revealed that producers under 40 years of age agreed more strongly with items IR1, IR2, IR3 and IR5. As such, these producers tend to think that the degree of responsiveness of the Canadian beef industry is rather low as they supported the statements that the Canadian beef industry ignores changes in consumer demands, is more supply-driven than demand-driven, is slow in the adoption of new production technologies and development of new products and is unable to react with a marketing plan in a timely fashion following a competitor's actions. In addition, producers over the age of 60 tend to think that the beef industry would be able to implement an immediate response following a competitor's threat (i.e., IR4) and producers in the age category 41-60 agreed more strongly that the Canadian beef industry is slow to react to changes in its policy environment. Similarly, producers with under 10 years of experience agreed more strongly with items IR1 (ignoring changes in consumer demands), IR3 (slow adoption of production practices and products) and IR5 (timely implementation following a competitor's threat), and producers with more than 30 years of experience agreed more strongly with items IR2 (supply-driven) and IR3. For the Irish sample, items IR2 and IR3 were significantly different from the neutral category, meaning that Irish producers agree that the Irish beef industry is more focused on generating a steady supply of beef products than consumer demands, and that the rate of technology adoption and product development is relatively low. However, the histograms indicated that an equal portion of Irish beef producers also disagreed with this last statement, and that answers for the items regarding the industry's degree of responsiveness following changes in consumer demands, a competitor's threat and policy changes fell in all answer categories. A closer look at the data (see Figure C.7 and C.8) revealed that producers in the age category 41-60 agreed more strongly with the fact that Irish beef production is more driven by supply than demand (score of 6.0 out of 7.0 for this age category) and that the Irish beef industry would design a response immediately following a competitor's threat. In addition, producers under 40 agreed more strongly to item IR6, that the Irish beef industry is slow to respond to changes in agricultural, environmental and trade policy. Similarly, producers with over 30 years of experience agreed more strongly with

items IR4 (immediate response following a competitor's threat) and IR5 (unable to implement that response in a timely fashion) and agreed less strongly with IR6 (slow response to policy changes).

Other important characteristics of the samples revealed that cow-calf producers clearly think that the Canadian beef industry is not as slow in adoption new production practices and methods as other beef producers think (see Figure C.9). For Ireland, part-time beef farmers clearly think that the Irish beef industry is slow in reacting to changes in policy, while full-time beef farmers agreed more strongly that the Irish beef industry ignores changes in consumer demands (see Figure C.10).

The most notable difference between the two samples is the notion that the Irish beef industry is more supply-driven than the Canadian beef industry.

Figure 7.10 presents the items regarding the general use of market intelligence and their average score for both Canadian and Irish beef producers, while standard deviations and t-values indicating significance compared to the neutral category of the 7-point Likert scale can be found in Table C.3.

Use of market intelligence[a]

| | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 |

MI1: Current use of market intelligence — Canada 4.7, Ireland 4.9

MI2: Future use of market intelligence — Canada 5.7, Ireland 6.0

■ Canada ■ Ireland

[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

Figure 7.10: Comparative results use of market intelligence

Both items were significant for both samples, indicating that producers in both samples agreed the strongest for their respective industries should make use of market intelligence now and in the future in order to react to external market factors. The Irish producers reacted even stronger to the two statements than their Canadian counterparts. With respect to age and experience in Canada (see Figures C.11 and C.12), producers in the age category 41-60 and producers with 10-30 years of experience agreed stronger to both statements, with the item regarding making use of

market intelligence in the future in particular (score of 6.1 and 6.3 out of 7.0, respectively). Similarly, with respect to age and experience in Ireland (see Figures C.13 and C.14), producers of the age 41-60 and producers with 10-30 years of experience agreed most strongly to MI2 (score of 6.8 and 6.5 out of 7.0, respectively), that the Irish beef industry should make use of market intelligence in the future.

Other important characteristics of the samples revealed that non-cow-calf producers tend to think that the Canadian beef industry should make more use of market intelligence in the future (i.e., item MI2) compared to cow-calf producers (score 6.0 and 5.7 out of 7.0, respectively) (see Figure C.15). Part-time beef farmers in Ireland agreed more strongly than Irish full-time beef farmers that the Irish beef industry currently makes use of market intelligence (i.e., item MI1), while full-time beef farmers saw a bigger need for using market intelligence in the future (i.e., item MI2) compared to part-time beef farmers (see Figure C.16).

Finally, the discussion in Chapter 5 regarding the different measurement indicators to quantify the level of market orientation suggested the exact level of market orientation for the Canadian and Irish beef industries could be quantified by combining the scores on the individual market intelligence items. However, the true score of an MO scale can be only be estimated rather than calculated as it is subject to random error or interpretation error by respondents (Strube, 2000). Such an estimation procedure could, for example, be executed using SEM, but unfortunately this was not possible in this thesis due to limited sample sizes. Alternatively, the degree of random and interpretation errors could be measured using reliability indicators such as Cronbach's alpha, but those numbers were questionable too (see Section 6.3). As such, one cannot truly know the level of market orientation for the Canadian and Irish beef industries in the context of this thesis.

Chapter 8: Discussion and conclusions

In the final chapter of this thesis, Section 8.1 discusses the results from Chapter 7 in a broader context as well as the implications of this work and areas for future research, and reflects on conducting and executing this research project. Section 8.2 then ends this thesis by drawing final conclusions and answering the research questions.

The focus of this thesis was the value of information as the most crucial resource to achieve economic performance for agricultural industries when positioning themselves strategically in dealing with uncertainties in their business and market environment. Market orientation argues that establishing and maintaining a competitive advantage requires a continuous understanding of the market one is operating in. As such, this thesis investigated the concepts of market orientation and the use of market intelligence about external market factors to give insights into how agricultural industries access and process information and produce knowledge from it to be responsive. In doing that, the objectives were to study which aspects are of influence on the value of information to agricultural industries, how information is used in strategic decisions and how the concept of market orientation can be measured at the industry level in agriculture. This thesis thereby took the beef industries in Canada and Ireland as examples as they are dealing with their own sets of challenges in their market environment, and extended a conceptual model previously developed and applied to the firm or value chain level to the industry level. This framework was then turned into a measurement indicator to be able to quantify the level of market orientation from a producer perspective and facilitate a benchmark and comparison of competitiveness between the Canadian and Irish beef industries. Data were collected using an online survey tool that was distributed among beef producers in Western Canada and Ireland. Although the data did not facilitate estimating the complete conceptual model and testing its associate relationships, this thesis provides results on how the beef industries in Canada and Ireland currently make use of market intelligence in responding to external market factors.

8.1   Discussion

The literature review in Chapter 3 showed that the concept of market orientation has been discussed quite extensively in the academic literature, whereby different definitions and conceptualizations of market orientation (MO) were proposed. MO was defined as a (business) culture, as a set of activities, and as a set of skills. Nevertheless, most studies agree that MO

consists of some form of collecting information, distributing it and responding to it, with the ultimate goal of creating differential value for the customer. In other words, agricultural industries that are market-oriented are well-informed about the market they are operating in and how that is affected by their broader environment. More importantly, market-oriented agricultural industries are aware of the value of information and use that to their advantage to create superior customer value and sustainable profits in the long run.

8.1.1   Canada

The Canadian beef industry can generally be characterized as commodity-oriented or supply-driven and subject to market forces, for which its reasons will be discussed below.

The National Beef Strategy has been developed to position the industry strategically and the survey results indicated that Canadian producers are aware that their industry currently makes use of market intelligence to improve its competitive position. The Canadian beef producers agreed in particular that information is collected on how consumers perceive the quality of Canadian beef products, which is an important focus of the pillar Beef Demand in the National Beef Strategy. The producers also agreed that information on competitors is generated independently by different organizations and that macroeconomic information is used within the Canadian beef industry. This latter type of information, with cattle numbers, the value of the Canadian dollar, the status of futures markets, and basis levels between Canada and the United States as examples, is also the most used information source to guide producers' marketing and strategic decisions. The facts that producers heavily rely on price information and are of the opinion that understanding sources of risk is part of good business decision-making are indicators of the commodity nature of the Canadian beef industry. The knowledge that producers could not agree on whether industry actors take the time to learn about others points to segmentation within the Canadian beef industry. The producers did agree that unfolding market trends and regulations in the US is the biggest threat to their industry, while they were of the opinion that export and trade agreements are the most important opportunity to the Canadian beef industry. Again, this confirms the reliance on trading partners (with the US in particular) and possibly explains why Canadian beef producers keep an eye on exchange and interest rates and like the overall industry to do so too.

However, market intelligence is only being used to a limited extent within the Canadian beef industry as producers could not agree unanimously whether market intelligence regarding future

consumer demands and new production technologies is distributed throughout the industry. The consequence of not disseminating information regarding future consumer demands or not having market foresight about these demands is being unable to deliver beef products that meet the expectations of both processors and consumers, a concern that was raised in Chapter 1. Producers did indicate that industry meetings, extension or research outcomes and advisor meetings do inform their marketing and strategic decisions but consult them only a few times per year or only on an annual basis. This potentially explains the limited awareness of new production technologies among producers. Producers were also divided about the extent to which industry meetings are held to update them on relevant external market factors, but the uncertainty around this topic could also be due to the infrequency of industry meetings.

In terms of responsiveness of the Canadian beef industry, beef producers had different opinions. Generally, producers thought that the Canadian beef industry is slow in reacting to competitors' threats and actions. However, younger and less experienced producers agreed the industry's degree of responsiveness is rather low, compared to the opinions of older producers. A low degree of responsiveness was also acknowledged by non-cow-calf producers in terms of using new production practices and technologies. This might be explained by the fact that feedlots for example have a faster turnover of animals than cow-calf producers. In addition, many opportunities in terms of new production practices and technologies are often too expensive to adopt for cow-calf producers. This also holds for niche consumer segments that often are too narrow or too expensive to service, even though producers generally think there are opportunities for the Canadian beef industry regarding different future consumer demands. For similar reasons, while all producers agreed that the Canadian beef industry should be more responsive in the future, this outcome was stronger for non-cow-calf producers.

The BCRC recently conducted a study about the long-term competitiveness of the Canadian beef industry from a producer perspective (BCRC, 2016). The results of that study and those of this thesis coincide regarding the importance of certain external market factors. Both studies indicated that improving attributes such as consistency and quality are important priorities for all production segments. In contrast, animal welfare was not that important for Canadian beef producers in both studies, even though this is a determinant of consumer confidence in the industry. The BCRC study also showed that social media is consulted often among Canadian beef producers while this was not the case in this thesis, perhaps due to a relatively older sample. Furthermore, the BCRC study indicated that advisors like veterinarians, followed by producers'

peers, producer associations and the BCRC itself were rated most influential for all beef producers, while feedlot producers relied more than other producers on professional consultants. Although producer meetings, advisors and extension or research outcomes were only consulted annually or a few times per year for the sample in this thesis, that does not indicate these sources are not of importance. Due to the infrequent nature of these sources, they could still be of significant influence on producers' decisions, as was found in the BCRC study.

Some important issues that weave through the above discussion for Canada include the relatively high average age of producers and the consolidation of beef cow herds over the period 2011-2016 following high price volatility. These issues make it difficult for Canada to be responsive to its market environment and adopting new programs and production practices. According to the 2016 Census of Agriculture, beef operations that have operators of under 35 years of age have the highest technology adoption rate, while beef operations with operators of over 55 years of age have the lowest technology adoption rates. Unfortunately, the lion's share of Canadian beef operations are managed by farmers of over 55 years, resulting in that fewer producers may be willing to comply with new production practices requiring intensive management and documentation. This ranges from optimizing their cow herd with procedures such as health surveillance as well as new industry initiatives such as VBP+ and sustainable beef production pilots. In addition, a smaller production base due to consolidation of the total beef cow herd also makes it more difficult to fully exploit increased market access and fulfill domestic demand in the coming years.

Chapter 2 hinted that production segments within the Canadian beef industry are benefiting from each other, meaning that profitability levels of the feedlot segment are high when those levels for cow-calf producers are low, and vice versa. This indicates that the value of information for Canadian beef producers is expressed as the final market price, again stressing the commodity nature and traditional segmentation of the Canadian beef industry. The distribution of information using traditional grading systems has been evolved into more modern information systems (e.g., Beef InfoXchange System (BIXS)) that return information regarding individual cattle and carcass production and performance to the producer. As such, these new systems involve many actors of the beef value chain and improves connectivity among these actors, another objective of the National Beef Strategy. Recommendations to the Canadian beef industry therefore include to further increase alignment within the industry, especially between the cow-calf and feedlot sector, by establishing a closer relationship and better information exchange.

Although information dissemination regarding new production technologies has been modernized over the last couple of years by using channels such as webinars, this could be improved by increasing presence of industry meetings and extension information online and on social media. However, this too is subject to the relatively high average age of current producers, resulting in a recommendation to improve programs and policies that ease the entry of and succession by young producers into the industry. This, together with a better alignment within the industry, will in turn affect the industry's level of market orientation and create both superior customer value and sustainable profits for all production segments in the long run.

8.1.2 Ireland

The Irish beef industry can generally be characterized as supply-driven and subject to policy forces rather than market forces as with the Canadian beef industry, which will be explained below.

In Ireland, the 10-year strategy Food Wise 2025 has been developed to position the Irish agricultural sector strategically, which includes its beef industry. The survey results for Ireland indicated that producers are aware that their industry currently makes use of market intelligence to improve its competitive position. Producers know that information is gathered on competitors and macroeconomic factors to some extent, as well that different organizations are involved in generating market intelligence. However, it is not clear to them what other factors are considered when collecting market intelligence. Producers agreed that information regarding new production technologies is communicated to them, but they did not acknowledge whether this also holds for information about consumer demands or other market developments. These issues are an indication of the policy forces of influence on the Irish beef industry. This is further stressed by a potential disconnect along the Irish beef value chain, as market information does not spread quickly through the value chain and producers are of the opinion that industry meetings are not being held very often. More importantly, some beef farmers produce mainly to satisfy processor specifications without being aware of other developments within the value chain (e.g. consumer developments), while others are involved in beef production just to qualify for receiving subsidies than to be influenced by market factors. Even though the Irish beef industry seems to be influenced by policy factors, the producers indicated that market trends in the UK and EU as well as ongoing regulation changes in the EU are a threat to the Irish beef industry and they like to be up-to-date on these matters.

In terms of responsiveness, the Irish beef industry does not score very well according to the producers sampled. These producers thought that their industry is supply-driven, slow in adopting new technologies, slow to react to policy changes, and ignores consumer demands. Younger producers and part-time producers in particular agreed on the slow reaction to policy changes. This latter result is surprising since often part-time producers have an off-farm income and are involved in beef production to catch subsidies. Full-time producers in particular agreed that the Irish beef industry ignores consumer demands, which could be explained by the fact that these producers are more dependent on market prices than subsidies and thus processor and consumer requirements.

While all producers agreed strongly that the Irish beef industry currently makes use of market intelligence, this effect was stronger for part-time producers. Similarly, full-time producers agreed more strongly that the Irish beef industry should make use of market intelligence in the future. Again, policy factors seem to be of influence here as part-time beef farmers, who most likely have an off-farm income and produce for subsidies, might be satisfied faster with how the beef industry reacts to external market factors while it is a more urgent matter for full-time beef farmers given their financial situation (as discussed in Chapter 2).

Thorne et al. (2016; 2017) recently conducted a study regarding the competitiveness of Irish agriculture and its individual sectors compared to its main competitors both within and outside the European Union. They found that productivity of the Irish beef sector was generally lower than its European competitors over the period 2004-2015, but that these differences became smaller over time. Both suckler cow enterprises and beef finishing enterprises had a competitive advantage over other EU countries when considering operating costs and some subsidies compared to total output value. However, this competitive advantage disappeared when other costs such as returns to land, labor or management and capital were taken into account, resulting in Ireland being classified as a high-cost producer within the EU. This also holds in a global context, as Ireland did not have a competitive advantage both based on operating and total economic costs. These results were stronger when some of the competitiveness indicators were calculated using market-based costs to account for the reliance on direct payments. Using this method, again Ireland did not have a competitive advantage over other EU countries and had significantly higher total economic costs as a percentage of market-based output compared to the other EU countries.

Some important issues that weave through the above discussion for Ireland are the reliance on direct payments or policy influence and a disconnect along the beef value chain that prevents the exchange of information within the Irish beef industry. Both these issues contribute to the lack of long-term competitiveness of its (specialist) beef sector that in turn affects the ability to fulfill current and future export and consumer demands.

Following the reform of the Common Agricultural Policy (CAP) in 2003 that came into effect in 2005, agricultural direct payments were decoupled from production. In theory, this should have resulted in that beef farmers are able to change more quickly between different production systems based on the expected profitability of these systems (e.g., influenced by season of production, calving period, and changes in costs and value of output) (Keane, 2008). In turn, this could also have increased the level of market orientation of the Irish beef industry, in particular when moving away from coupled payments or in other words constrained production systems. However, to date there has been little change due to low or negative gross margins from beef production, where the new direct but decoupled payments provide a cushion. Little change also has occurred because of the seasonality of beef production in Ireland as it makes use of a grass-based production system and thus producing mainly spring-born calves. In addition, fattening of animals over the winter can be risky and expensive in Ireland as one is uncertain of a price increase for finished animals over the fall till spring period.

This brings us to the potential disconnect along the Irish beef value chain, as Irish beef farmers depend on price and carcass information they receive from processors. However, this information is often presented in small windows and heavily influences the profitability of Irish beef farms (besides the reliance on direct payments), while there is no lack of profitability in the processing sector. As such, like the Canadian beef industry, the value of information for the Irish beef industry also lies in the market price beef farmers receive from the next value chain actor, despite a significant policy influence. This also contributes to the supply-driven nature of the Irish beef industry, as noted by the sampled beef producers.

The future of the Irish beef industry will be determined by several factors. First, as Ireland exports a high proportion of its beef products, the future of the Irish beef industry will depend on these trading partners as well as on the possibility to diversify trade with other international markets following Brexit. However, recently signed trade agreements such as CETA and with Mercosur also cause more beef products to be imported to the European Union and Ireland, which in turn could lead to an increase in the number of part-time farmers if Ireland cannot maintain its current

share. To that end, the Irish beef industry will further need to brand and market its use of an environmentally sustainable grass-based production system.

Second, the future of the Irish beef industry depends on developments in the dairy sector. The influx from the dairy sector after the milk quota abolition in 2015 provides additional opportunities to fulfill domestic and export demands. However, downsides to these developments include that some farmers convert from beef farming to dairy farming for commercial reasons, while the additional animals from the dairy sector also contribute to a potential decline in the quality of beef products as the biological variation is increased. This in turn will affect the ability of the Irish beef industry to meet the demand for consistent quality from processors and consumers (a concern also raised in Chapter 1).

Lastly, the future of the Irish beef industry lies in the ability of Irish beef farms to capture sustainable profits from influences of market forces rather than policy forces. This is especially important as the general trend within the European Union is towards less trade- and price-distorting agricultural income support systems. In other words, the relative costs and production efficiency of Irish beef farms becomes more and more important to ensure the cost of production is less than the market price, in particular with a high export focus and increased imports. Due to the relatively high proportion of part-time beef farmers, the size of the average beef farm is currently insufficient to exploit economies of scale (Thorne et al., 2016). In addition, it is expected that world beef prices will be subject to (increased) volatility in the future, while profitability levels will not see much change as input prices will likely also be increased (Thorne et al., 2016). The suckler cow segment is the backbone of the Irish beef industry and the foundation of Irish beef trade and live exports. Even though beef farmers use better quality bulls and breeding stock, these farmers are getting less for their product, real farm incomes are declining and beef farmers are exiting suckler cow production as a result.

Recommendations for the Irish beef industry therefore involves solving the disconnect within the industry and improve information exchange. The value of information within the Irish beef industry is the market price, which is affected by carcass quality. However, carcass quality is more difficult to define in today's marketplace and it is a challenge to target the right grade demanded by a specific processor. As the disconnect exists mainly between the production segments on the one hand and processors on the other hand, increased alignment of these actors would be beneficial for the entire beef industry.

A second recommendation for the Irish beef industry is to increase productivity by increasing the average farm size to ensure a sustainable profitability level of Irish beef farms. Consolidation of

the suckler cow segment will help in exploiting economies of scale, as well as provide a solution for the many beef farmers that likely will retire in the near future given the relatively high average age of beef farmers in Ireland.

One aspect that is currently preventing consolidation of Irish beef production is limited land mobility, a high degree of land fragmentation and a high use of short-term land rental agreements. Better land mobility would therefore facilitate lower capital costs, that in turn stimulate profitability levels of Irish beef farms. A third recommendation to the Irish beef industry therefore is to increase land mobility, for example by creating more awareness of current (tax) incentives for increased land mobility, stimulate long leasing arrangements and develop and promote collaboration models between older and younger farmers (Macra na Feirme, 2014).

Following through with these recommendations will have positive consequences for the adoption of technologies and management practices such as the Beef Quality Assurance Scheme (BQAS) and beef discussion groups and achieving the Food Harvest 2020 targets. In addition, this will positively influence commercial decision-making and responsiveness to price and market signals within the industry, which will affect the industry's level of market orientation and create both superior customer value and sustainable profits for all production segments in the long run.

8.1.3   General discussion

The previous sections hinted that both the Canadian and Irish beef industries have room to improve their level of market orientation as market intelligence is only being used to a limited extent according to the beef producers surveyed. One observation for this result is that this is simply only one side of the coin in perceiving market orientation, i.e. only beef producers' opinions were taking into account as opposed to the opinions of other relevant beef industry stakeholders.

No matter whose opinions are considered, following basic economic and marketing principles all entities in general (whether single producers or firms, value chains or entire industries) have to position themselves strategically to be able to sell its goods and products. This is a result of two trading partners dealing with imperfect information regarding price and quality. As such, every economic unit is required to be "market oriented" all the time, at least in theory.

This thesis showed that beef industries are operating in a broader environment of competitive pressures, regulations, and other market and policy forces. Following the economic theory as mentioned above, beef industries as one entity should position themselves strategically and thus be aware of developments within this broader market environment and collect market intelligence

about these factors to be able to implement a response to them. At the producer level, commodity producers such as beef producers should in turn be aware of the collected market intelligence or market signals beyond the traditional price signals. Indeed, Micheels (2010) found that market-oriented beef producers may be able to better utilize non-price signals to achieve superior performance when operating in a more differentiated and fragmented agricultural market. However, when looked at the industry level, the results of this thesis showed that the value of information for both the Canadian and Irish beef industries is still the market price. Market and price reports play an important role in the collection of information within these industries as well as in the sectors studied by Grunert et al. (2005). Again, following basic economic theory, prices reflect the value a customer attaches to a product, and so producer prices should in theory reflect consumer demands and broader societal developments to some extent. This brings us to the question whether collecting market and price information is the ultimate market-oriented behavior as opposed to considering other factors as so widely discussed in the academic literature. Following Grunert et al. (2005), the definitions of market orientation and market intelligence used in this thesis encompassed the heterogeneity in consumer preferences and its changes over time, to complement market and price information. However, given that the value of information for both the Canadian and the Irish beef industries is the final market price, we might have to agree with Kumar et al. (2011) that the definition of MO is smaller than first anticipated and that being market-oriented as a firm, value chain or industry is simply the "cost of competing".

Future research in this area could therefore be longitudinal of nature, which would serve two purposes. First, a longitudinal study would contribute to a better understanding of the concept of market intelligence and what it exactly entails, as a time component is present in the currently used definition both by Grunert et al. and this thesis. This would then facilitate a comparison as changes over time that occur in consumer preferences and price information can be taken into consideration. Second, a longitudinal study would contribute to more accurately measuring the exact level of market orientation of an entity, as changes in the MO level between time periods possibly influences results in terms of performance measurements and therefore policy implications (Micheels, 2010; Hult and Ketchen, 2017).

From a more applied perspective, future research involving market orientation and market intelligence could also be using beef industries in different countries as well as agricultural industries from other sectors, since an alternative measurement indicator of competitiveness was developed in this thesis. This would facilitate a benchmark between different countries (e.g., small and large producers of beef, importers and exporters) and across different sectors (e.g.,

commodity vs. value-added, grains vs. livestock), which in turn would contribute to a better understanding of the market orientation concept as well as the surviving and strategic positioning of an agricultural producer in a marketplace that is becoming more diversified and competitive in nature.

Like every other research project, this thesis has its limitations which should be noted. One important critique is that the conceptual model developed in this thesis is based on fairly outdated literature. Even the case studies of agricultural supply chains by Grunert et al. (2002; 2005) were conducted more than 10 years ago, while the basic market orientation literature is more than 25 years old. This questions the relevancy of the models in these studies for today's circumstances. The biggest restriction however, is the inability of determining the exact level of market orientation for the two beef industries and testing the hypotheses regarding market orientation and its intelligence concepts. These restrictions are the result of limited sample sizes and non-representative samples, and led to being unable to draw conclusions about determinants of market orientation in the context of agricultural industries. As such, caution is needed in generalizing the results. A possible explanation for the limited sample size is the time of year when the questionnaire was administered, although sampling is also subject to the engagement of the target audience with the research topic. However, the findings, including the establishment of a new measurement scale, can serve as a basis for future operationalizations to measure the character and level of market orientation of agricultural industries.

8.2   Conclusions

Given what has been discussed in this thesis and in Section 8.1, conclusions are drawn in terms of answering the research questions.

The answer to the first research question "How are the beef industries in Canada and Ireland organized and what is currently done to increase the level of market orientation?" is that the Canadian and Irish beef industries are organized rather similar in terms of product flow and production segments (e.g., cow-calf vs. suckling segment, backgrounding vs. store production, feedlots vs. finishing segment). Both industries have one major trading partner with whom they face some challenges, i.e. the United States for Canada and the United Kingdom for Ireland. The Canadian and Irish beef industries differ in terms of size, as well as market influence. The Irish beef industry is highly subject to policies and subsidies from the European Union, while the

Canadian beef industry depends more on market forces and is therefore more commodity-oriented.

Both beef industries have plans and programs in place to increase the level of market orientation and thus competitiveness. This is captured in the National Beef Strategy for Canada, which focuses on promoting and marketing Canadian beef products both domestically and internally, strengthening consumer confidence, and increasing technology transfer activities to stimulate the adoption of new technologies. The Irish beef industry uses the strategies Food Harvest 2020 and Food Wise 2025 developed by the overall Irish agri-food sector. These strategies are relevant to using market intelligence as they aim to improve beef farmers' profitability levels by educating them about how to make use of their resources and the latest technologies in the most productive and sustainable way (e.g., via Knowledge Transfer Groups, discussion groups, Teagasc/IFJ BETTER Farm Beef Programme); to maintain and improve on-farm competitiveness levels (e.g., by stimulating sustainable management practices); to identify and understand specific market requirements in premium markets; and to improve coordination between different industry stakeholders.

The second research question looked into how the concept of market orientation in an agricultural setting at industry can be modeled and quantified. MARKOR, the measurement indicator for market orientation originally developed by Kohli et al. (1993), which centers around the three intelligence concepts, has been adapted by Matsuno et al. (2000; 2005) and Min et al. (2007) in order to assess the level of market orientation at the value chain level. This thesis has shown that MARKOR can be modified even further to be able to model the level of market orientation at industry level. Another important aspect of the modification process was to consider case-specific practices (i.e., relevant to a beef industry) and terminology suitable to the target audience (i.e., beef producers) to reflect the agricultural setting. This has resulted in a new measurement indicator that facilitates benchmarking in terms of competitiveness in agriculture, when the sample size is sufficient. This new measurement indicator is more generally applicable to different industries, sectors or countries beyond the beef industries in Canada and Ireland, while able to consider a big range of external market factors.

Studying the determinants of market orientation and producer decision-making processes in the Canadian and Irish beef industries has led to resulted in an adapted conceptual model based on Grunert et al. (2002; 2005) and the specifics of the Canadian and Irish beef industries. Although several of the determinants proposed by Grunert et al. returned in the adapted conceptual models

(e.g., end-user heterogeneity, raw material heterogeneity, regulations, mental models), important modifications have been made. The most important modification is the incorporation of the three intelligence concepts, which theoretically allows to test for causal effects between these concepts. Another important modification centers on the focus of the model. Where the models by Grunert et al. tend to focus on relational characteristics within the value chain, the adapted conceptual model focused more on developments in the environment and how that affects the level of market orientation of the Canadian and Irish beef industries.

From a theoretical perspective therefore, the answer to the third research question is that the determinants of market orientation of the Canadian and Irish beef industries include external market factors (i.e., end-user heterogeneity, raw material heterogeneity, regulations and trade agreements), structural firm-specific factors, information sources and channels, decision-making processes on individual operations, and social and professional relationships. Similarly, the determinants of producer decision-making processes in the Canadian and Irish beef industries are the persons that influence or are involved in the decision-making process and psychometric characteristics of the decision-maker. This was confirmed in the empirical part of this thesis for both sets of determinants, as structural firm-specific factors like age, production segments (e.g., cow-calf vs. feedlot), part-time vs. full-time and experience in beef production were drivers of the results. Furthermore, consulting different information sources, opportunities for trade agreements, threats from major trading partners as well as consumer demand for e.g. grass-fed beef products were found to be important determinants of making use of market intelligence and producer decision-making processes in the Canadian and Irish beef industries.

The fourth research question looked into what the differences and similarities are between the Canadian and Irish beef industries when they make use of market intelligence.
According to the producers sampled, the Canadian and Irish beef industries differ in their intelligence generation activities. Whereas the Canadian beef industry collects information regarding macroeconomic factors, how changing (business) regulations could affect consumer demand, and how consumers perceive the quality of Canadian beef products, mainly information regarding competitors is collected by different organizations within the Irish beef industry.
The Canadian and Irish beef industries also differ in their intelligence dissemination activities, for which Irish producers are much less aware that information is being distributed within their industry. The Canadian producers are relatively neutral about the occurrence of information distribution, except for the circulation of business information relating to consumers. However, according to the Irish producers sampled, the Irish beef industry does not have industry-wide

meetings very often and consumer demands are not communicated back to producers. This latter lack of communication, together with the fact that market information does not spread quickly through all organizations of the Irish beef industry, further accentuates the policy nature of the Irish beef industry.

With respect to intelligence responsiveness activities, both countries have a rather similar approach. The producers sampled for both countries agreed that their industry is slow in responding to policy changes, competitors' actions, and is slow in the adoption of new production practices and developing new products. A major difference here is that the Irish beef industry is perceived to be more supply-driven than the Canadian beef industry.

The last research question, "Which improvements can be made in the Canadian and Irish beef industries to increase the level of market orientation", can be answered by listing the recommendations for both beef industries. For Canada, it is important that alignment within the industry is further increased, especially between the cow-calf and feedlot sector, such that traditional segmentation is reduced and information can be better exchanged. Other recommendations for Canada include to (further) increase the presence of industry meetings and extension information online, and to improve programs and policies that stimulate the presence of young producers in the industry. For Ireland, it is important to improve the alignment within the industry, especially between the production segments on the one hand and the processors on the other hand, and to increase information exchange and solve the existing disconnect of the industry. Other recommendations for Ireland include to consolidate the suckler cow segment and increase productivity on larger farms to ensure a sustainable profitability level and to increase land mobility in order to decrease the level of land fragmentation.

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Appendix A: Comparison of original and adapted MI statements

Table A.1: Comparison of original market intelligence statements with adapted statements

	Statements used by Min et al. (2007)	Statements adapted to farmer language in Canada
Intelligence generation	We poll end users at least once a year to assess the quality of our products and services	The beef industry polls end consumers at least once a year to assess the quality of our products and services
	In our business unit, intelligence on our competitors is generated independently by several departments	In the beef industry, market intelligence on competitors is generated independently by several organizations
	We periodically review the likely effect of changes in our business environment (e.g., regulation) on customers	* The industry does not periodically review the likely effect of changes in our business environment (e.g., regulations) on consumers
	In this business unit, we frequently collect and evaluate general macroeconomic information (e.g., interest rate, exchange rate, GDP, industry growth rate, inflation rate)	In this industry, general macroeconomic information (e.g., exchange rate, inflation rate) is frequently collected and evaluated
	In this business unit, we collect and evaluate information concerning general social trends (e.g., environmental consciousness, emerging lifestyles) that might affect our business	* In this industry, information regarding general social trends (e.g., environmental consciousness, emerging lifestyles) that might affect our business is not collected and evaluated
	In this business unit, we spend time with our suppliers to learn more about various aspects of their business (e.g., manufacturing process, industry practices, clientele)	In this industry, time is spent with each other to learn more about various aspects of one another's business
Intelligence dissemination	Marketing personnel in our business unit spend time discussing customers' future needs with other functional departments	* Marketing personnel in the beef industry does not spend time discussing consumers' future needs with producers
	Our business periodically circulates documents (e.g., reports, newsletters) that provide information on our customers	The industry periodically circulates documents (e.g., reports, newsletters) that provide business information on our consumers
	We have cross-functional meetings very often to discuss market trends and developments (e.g., customers, competition, suppliers)	* The industry does not have cross-functional meetings very often to discuss market trends and developments (e.g., about consumers, competitors, suppliers)
	Technical people in this business unit spend a lot of time sharing information about technology for new products with other departments	Technical people in this industry spend a lot of time sharing information about technology for new products with producers

	Market information spreads quickly through all levels in this business unit	* Market information does not spread quickly through all levels in this industry
Intelligence responsiveness	* For one reason or another, we tend to ignore changes in our customers' product or service needs	* For one reason or another, the beef industry tends to ignore changes in our consumers' product or service needs
	* The product lines we sell depend more on internal politics than real market needs	* The products the industry sells depend more on internal politics than real market needs
	* We are slow to start business with new suppliers even though we think they are better than existing ones	* The industry is slow to adopt practices and develop new products, even though it thinks they are better than existing ones
	If a major competitor were to launch an intensive campaign targeted at our customers, we would implement a response immediately	If a major competitor were to launch an intensive campaign targeted at our consumers, the industry would implement a response immediately
	* Even if we came up with a great marketing plan, we probably would not be able to implement it in a timely fashion	* Even if the industry came up with a great marketing plan, it probably would not be able to implement it in a timely fashion
	* We tend to take longer than our competitors to respond to a change in regulatory policy	* The beef industry tends to take longer than our competitors to respond to a change in regulatory policy
General market orientation		Given the definition of market orientation above, I think the Canadian beef industry is market oriented
		An industry-wide market orientation is necessary to have a competitive industry and to move forward into the future
		* An increased intensity of competition from other countries is not a basis to have an industry-wide market orientation
		An industry-wide market orientation is necessary because of an increased negative public image of the beef sector
		Information is not a crucial element for having a competitive industry
		I see clear results of responding to market intelligence at the farm level, e.g., on my own operation by changing production practices and processes
		I see clear results of responding to market intelligence at the industry level, e.g. of industry efforts that aim to improve the overall competitiveness

* indicates reversed statement

Appendix B: Questionnaire Canada

FACULTY OF AGRICULTURAL, LIFE & ENVIRONMENTAL SCIENCES

DEPARTMENT OF RESOURCE ECONOMICS & ENVIRONMENTAL SOCIOLOGY

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Study title:
The use of market intellligence and decision-making as a driver of industry competitiveness: A producer's perspective on the Canadian and Irish beef industries

Dear beef producer,

You are invited to take part in this Internet-based research survey in which we investigate the use of market intelligence by beef producers in daily and strategic decision-making. **The purpose of this study** is to learn about the **use of market intelligence** in the beef industry when dealing with various market challenges. By looking at how **you** as an individual producer perceive this **and** use information on potential opportunities and/or threats to make business decisions, we want to shed light on the value of market intelligence in decision-making in maintaining and strengthening the industry's competitive position. The final research product will also provide insights into the role market intelligence plays as part of the strategic direction of the overall beef industry in Canada.

This study will be conducted in both Western Canada and Ireland, and is carried out by MSc student Jolien Witte and her supervisor Dr. Sven Anders in the Department of Resource Economics and Environmental Sociology (REES) at the University of Alberta. Our Irish research partner is Dr. Maeve Henchion in the Department of Agri-food Business and Spatial Analysis at Teagasc, the national Agriculture and Food Development Authority in Ireland. The study is funded by Teagasc through a student fellowship.

In this survey we invite you to respond to a series of questions that allow us to better understand your beef cattle operation and the structure of your farm business. We then ask you a series of questions regarding how you make business decisions and the factors that you consider when making business decisions in different situations.

Please take as much time as you need to answer all questions. Most of them only require you to check a box and you should be finished in about 15 minutes. Please make use of the text box at the end of the survey to share any thoughts and/or questions with us. This survey and research project have been approved by a Research Ethics Board of the University of Alberta. For questions regarding participants

rights and ethical conduct of research, please contact the Research Ethics Office at 780-492-2615. Following the ethics approval we are required to advise you the following:

- Your participation is voluntary and all of your answers will be kept strictly confidential.
- You may withdraw your response from the study at any point in time, however responses already submitted cannot be retrieved.
- The data from this survey will be stored in a password-protected folder for a minimum of 5 years following the completion of this research project, and will only be made available to Jolien Witte and Drs. Anders and Henchion for the purpose of this study.
- You are invited to submit your email address to receive a summary report once this study is completed. Your email address will be used to send you a summary report only and no sales solicitation is involved.
- There are no costs involved in participating in this research project, and no reasonable foreseeable risks are known that may arise as a result of participation.
- Your answers will be used for research purposes only.

We will ask for your consent to participate in this study on the next page. You are welcome to contact any of the project collaborators (contact details below) to discuss any aspect of this study further. Please note that you are able to pause this questionnaire and come back to it at a more convenient time.

Thank you for your participation!

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Consent statement

I have read the previous invitation letter and the research study has been explained to me. I have been given the opportunity to ask questions and any questions I had have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described before.

By checking below the box "Yes" I am indicating that I have read and understood the above information and give consent to participate in this study.

☐ Yes   ☐ No

Section A: Background questions

First, we would like to ask you some questions to help us better understand your operation.

1. Are you currently producing beef cattle on your farm?
   ☐ Yes, on a beef operation   proceed to question 2
   ☐ Yes, on a mixed operation   proceed to question 2
   ☐ No   end of survey

2. Are you the primary decision-maker for the operation?
   ☐ Yes
   ☐ No

3. In 2016, which of the following livestock enterprises were part of your operation? Please check all that apply.
   ☐ Cow-calf
   ☐ Backgrounding
   ☐ Breeding / Seedstock production
   ☐ Finishing / Feedlot

4. How would you characterize your cow-calf operation?
   ☐ Cow-calf: Calves sold at weaning or within one month after weaning
   ☐ Cow-calf, but calves retained through a summer grazing program/preconditioning phase
   ☐ Cow-calf and backgrounding: Calves retained and sold as heavier feeder cattle
   ☐ Cow-calf through finishing: Calves retained and sold as fed cattle
   ☐ Not applicable
   ☐ Other, please specify: _____

5. Approximately how many **beef cattle** were on your farm on average in 2016? Please only fill in the categories relevant to your operation.

Type of beef cattle	Number
Beef cows	
Bulls	
Replacement heifers	
Weaned calves kept for backgrounding	
Steers sold out of the cow-calf operation to be backgrounded	
Heifers sold out of the cow-calf operation to be backgrounded	
Steers sold out of the backgrounding operation to be finished	
Heifers sold out of the backgrounding operation to be finished	
Cows sold out of the finishing operation	
Steers sold out of the finishing operation	
Heifers sold out of the finishing operation	

Section B: External market factors and market intelligence

In this section we would like to get your view on potential external market factors that affect the Canadian beef industry, and how market information may be used to respond to these issues.

Please indicate to which extent you agree or disagree with the following statements. Please select the answer category that most closely reflects your view.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Strongly agree
Consumer demand for farm animal welfare is a **threat** to the Canadian beef industry							
Consumer demand for a certain attribute (e.g., tenderness) is an **opportunity** for the Canadian beef industry							
Consumer demand for grass-fed and/or pasture-fed is a **threat** to the Canadian beef industry							
Consumer demand for beef from a certain breed (e.g., Angus, Hereford) is an **opportunity** for the Canadian beef industry							
Consumer demand for organic beef is an **opportunity** for the Canadian beef industry							
Climate change is a **threat** to the Canadian beef industry							
US market trends and regulations are a **threat** to the Canadian beef industry							
Federal and provincial regulations are a **threat** to the Canadian beef industry							
Export and trade agreements (e.g., the Comprehensive Economic Trade Agreement (CETA) between Canada and the European Union) are an **opportunity** for the Canadian beef industry							

The definition below describes the concept of market intelligence.

> *"Market intelligence is the consideration of external market factors that can affect current and future consumer demands and preferences."*

In this section, we would like to ask your opinion about how the Canadian beef industry **currently** uses market intelligence. With "industry" we mean the organizations involved in the supply chain, from producer to retailer, as well as supporting and representative organizations and their initiatives that have been designed to improve the overall sector. Examples of such organizations and initiatives are provincial producer organizations, the Canadian Cattlemen's Association (CCA), the Beef Cattle Research Council (BCRC), Canada's Roundtable for Sustainable Beef (CRSB).

In the following questions we ask you **to share your opinion** on a number of market intelligence aspects that apply to the **current state** of the Canadian beef industry (as defined above). Please remember that we are interested in your view of the use of market intelligence at the industry level, even though the following statements might not be necessarily applicable to yourself and/or your beef operation.

Please carefully read the following statements and indicate to which extent you agree or disagree.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Strongly agree
The Canadian beef industry surveys end consumers at least once a year to assess the perceived quality of Canadian beef products							
Within the Canadian beef industry, market intelligence on competitors (e.g., other meat producing sectors (e.g., poultry), other beef producing countries) is generated independently by several organizations							
The Canadian beef industry does not periodically review the likely effect of changes in its business environment (e.g., regulations) on its consumers							
Within the Canadian beef industry, general macroeconomic information (e.g., exchange rate, inflation rate) is frequently collected and evaluated							
Within the Canadian beef industry, information regarding general social trends (e.g., environmental consciousness, emerging lifestyles) that might affect its business is not collected and evaluated							

> *"Market intelligence is the consideration of external market factors that can affect current and future consumer demands and preferences."*

With "industry" we mean the organizations involved in the supply chain, from producer to retailer, as well as supporting and representative organizations and their initiatives that have been designed to improve the overall sector.

Based on the concept of market intelligence described above, please indicate to which extent you agree or disagree with the following statements. Please remember that we are interested in your view of the use of market intelligence at the industry level (as defined before), even though the statements below might not be necessarily applicable to yourself and/or your beef operation.

	Strongly Disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Strongly agree
Within the Canadian beef industry, time is spent with each other to learn more about various aspects of one another's business							
Marketing personnel in the Canadian beef industry do not spend time discussing consumers' future demands with producers							
Within the Canadian beef industry, business information (e.g., reports, newsletters) relating to its consumers is periodically circulated among each other							
The Canadian beef industry does not have industry-wide meetings very often to discuss market trends and developments (e.g., about consumers, competitors, suppliers)							
Researchers in the Canadian beef industry spend a lot of time sharing information about new production technologies with producers							

> *"Market intelligence is the consideration of external market factors that can affect current and future consumer demands and preferences."*

With "industry" we mean the organizations involved in the supply chain, from producer to retailer, as well as supporting and representative organizations and their initiatives that have been designed to improve the overall sector.

Based on the concept of market intelligence described above, please indicate to which extent you agree or disagree with the following statements. Please remember that we are interested in your view of the use of market intelligence at the industry level (as defined before), even though the statements below might not be necessarily applicable to yourself and/or your beef operation.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Strongly agree
Market information does not spread quickly through all organizations in the Canadian beef industry							
The Canadian beef industry tends to ignore changes in its consumers' product demands							
The products the Canadian beef industry sells are more driven by supply than real market demands							
The Canadian beef industry is slow to adopt new practices and develop new products							

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> *"Market intelligence is the consideration of external market factors that can affect current and future consumer demands and preferences."*

With "industry" we mean the organizations involved in the supply chain, from producer to retailer, as well as supporting and representative organizations and their initiatives that have been designed to improve the overall sector.

Based on the concept of market intelligence described above, please indicate to which extent you agree or disagree with the following statements. Please remember that we are interested in your view of the use of market intelligence at the industry level (as defined before), even though the statements below might not be necessarily applicable to yourself and/or your beef operation.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Strongly agree
If a major competitor (e.g., another beef producing country, another meat producing sector) were to launch an intensive campaign targeted at its consumers, the Canadian beef industry would implement a response immediately							
If the Canadian beef industry came up with a great marketing plan following a competitor's threat, it probably would not be able to implement it in a timely fashion							
The Canadian beef industry tends to take longer than its competitors (e.g., other meat producing sectors, other beef producing countries) to respond to a change in agricultural, environmental and trade policy							
The Canadian beef industry currently makes use of market intelligence to improve its competitive position							
The Canadian beef industry needs to make use of market intelligence in the future in order to deal with market challenges							

Section C: Information use and decision-making

This section focuses on your use of information in different decision-making processes on your operation. We will ask you about the sources of information you use for **4 different decision-making processes.**

Please indicate how often you consult the following sources of information when it comes to **input or buying decisions** for your beef operation.

	Daily	Multiple times a week	Weekly	Monthly	A few times per year	Annually	Not at all
Advisors: e.g., accountant, broker, nutritionist, veterinarian							
Extension tools and research outcomes from universities, research institutions and industry							
Family members							
Farm print media: e.g., Western Producer, Canadian Cattlemen, cattle breed magazine							
Market and price reports: e.g., CanFax updates, Chicago Mercantile Exchange (CME) reports							
Other (beef) producers who are non-family partners							
Other beef producers in an informal setting, e.g., neighbors, others in the community							
Producer and industry meetings							
Social media							
Strategic documents and financial records							

Please indicate how often you consult the following sources of information when it comes to **output or marketing decisions** for your beef operation.

	Daily	Multiple times a week	Weekly	Monthly	A few times per year	Annually	Not at all
Advisors: e.g., accountant, broker, nutritionist, veterinarian							
Extension tools and research outcomes from universities, research institutions and industry							
Family members							
Farm print media: e.g., Western Producer, Canadian Cattlemen, cattle breed magazine							
Market and price reports: e.g., CanFax updates, Chicago Mercantile Exchange (CME) reports							
Other (beef) producers who are non-family partners							
Other beef producers in an informal setting, e.g., neighbors, others in the community							
Producer and industry meetings							
Social media							
Strategic documents and financial records							

Please indicate how often you consult the following sources of information when it comes to **your short-term management or operational decisions** for your beef operation, decisions that are not necessarily related to buying or marketing decisions.

	Daily	Multiple times a week	Weekly	Monthly	A few times per year	Annually	Not at all
Advisors: e.g., accountant, broker, nutritionist, veterinarian							
Extension tools and research outcomes from universities, research institutions, and industry							
Family members							
Farm print media: e.g., Western Producer, Canadian Cattlemen, cattle breed magazine							
Market and price reports: e.g., CanFax updates, Chicago Mercantile Exchange (CME) reports							
Other (beef) producers who are non-family partners							
Other beef producers in an informal setting, e.g., neighbors, others in the community							
Producer and industry meetings							
Social media							
Strategic documents and financial records							

Please indicate how often you consult the following sources of information when it comes to **longer term planning or strategic decisions** for your beef operation, decisions that are not necessarily related to buying or marketing decisions.

	Daily	Multiple times a week	Weekly	Monthly	A few times per year	Annually	Not at all
Advisors: e.g., accountant, broker, nutritionist, veterinarian							
Extension tools and research outcomes from universities, research institutions and industry							
Family members							
Farm print media: e.g., Western Producer, Canadian Cattlemen, cattle breed magazine							
Market and price reports: e.g., CanFax updates, Chicago Mercantile Exchange (CME) reports							
Other (beef) producers who are non-family partners							
Other beef producers in an informal setting, e.g., neighbors, others in the community							
Producer and industry meetings							
Social media							
Strategic documents and financial records							

In last two questions of this section we ask you to share your opinion on what constitutes good business decision-making.

Please carefully read the following statements and indicate to which extent you agree or disagree.

"To me, good business decision-making …"

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Strongly agree
…means keeping with the same production methods that have stood the test of time							
…is impacted by what is going on at the time on the farm, e.g. weather, machinery breakdowns							
…means being prepared to give it a go and take risks in changing production systems, technologies, marketing approaches							
…means that in times of business challenges I rely on experience rather than external information							
…means understanding sources of risk and what can be done to reduce their impact							

Please carefully read the following statements and indicate to which extent you agree or disagree.

"To me, good business decision-making …"

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Strongly agree
…means being able to learn from experience, mistakes and failures							
… means investigating new production or farming methods							
…means being up-to-date with the current condition of the operation in its totality (e.g. bank balances, animal performance, crop growth, soil moisture, feed levels, machinery repair)							
…means being able to predict product prices into the foreseeable future, or at least understanding the factors that determine the prices, and understand market requirements							
…means being able to look ahead and anticipate any likely problems, needs and opportunities							

Section D: Background questions

1. Are you involved with one or more of the following associations? Please check all that apply.
   - ☐ Alberta Beef Producers (ABP)
   - ☐ Alberta Cattle Feeders Association (ACFA)
   - ☐ BC Association of Cattle Feeders (BCACF)
   - ☐ BC Cattlemen's Association (BCCA)
   - ☐ Feeders' Association of Alberta (FAA)
   - ☐ Manitoba Beef Producers
   - ☐ Saskatchewan Cattle Feeders Association (SCFA)
   - ☐ Saskatchewan Cattlemen's Association (SCA)
   - ☐ Saskatchewan Stock Growers Association (SSGA)
   - ☐ Western Stock Growers' Association (WSGA)
   - ☐ Some crop or forage association
   - ☐ Some national or provincial cattle breed association
   - ☐ Some regional agricultural research association
   - ☐ Other, please specify: _____
   - ☐ None

2. Do you know which market you are producing for? Please check all that apply.
   - ☐ Export
   - ☐ Domestic
   - ☐ Own consumption and that of some family and/or community members
   - ☐ Other, please specify: _____
   - ☐ Don't know

3. Are you following a specific (certified) production system? Please check all that apply.
   - ☐ Certified organic
   - ☐ Certified humane
   - ☐ Angus
   - ☐ Certified Angus
   - ☐ Grass-fed
   - ☐ Verified Beef Production / Verified Beef Production Plus
   - ☐ Other, please specify:
     _____
   - ☐ No, I use a conventional production system

4. Approximately, what is the total area farmed in acres, i.e., land owned plus land rented or leased, for all of your enterprises (e.g., beef, crops) in total?
   _____ acres

5. What province do you primarily operate in?
   - ☐ British Columbia
   - ☐ Alberta
   - ☐ Saskatchewan
   - ☐ Manitoba

6. Please indicate to which age group you belong.
    - ☐ < 20 ☐ 51 – 55
    - ☐ 21 – 25 ☐ 56 – 60
    - ☐ 26 – 30 ☐ 61 – 65
    - ☐ 31 – 35 ☐ 66 – 70
    - ☐ 36 – 40 ☐ 71 – 75
    - ☐ 41 – 45 ☐ > 75
    - ☐ 46 – 50

7. Please indicate your gender.
    - ☐ Female
    - ☐ Male

8. For approximately how many years have you been a decision-maker in your beef operation?
    _____ years

9. Please indicate the highest level(s) of education you have obtained.
    - ☐ High school
    - ☐ Trade or technical school
    - ☐ Professional degree
    - ☐ College degree
    - ☐ University or bachelor's degree
    - ☐ Graduate degree
    - ☐ Other completed courses or certificates, please specify: _____

10. How is ownership of your farm organized?
    - ☐ Sole proprietorship
    - ☐ Family-owned corporation or Ltd. company
    - ☐ Partnership with a written agreement
    - ☐ Partnership without a written agreement
    - ☐ Corporation with non-family investors
    - ☐ Other, please specify: _____

11. Do you farm full-time or part-time?
    - ☐ Full-time
    - ☐ Part-time

Section E: Wrap-up

1. Do you have any comments or suggestions that you would like to share with us?

_____
_____
_____
_____
_____
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2. Would you like to receive a summary report of this research project?
   ☐ No
   ☐ Yes, my email address is: _____

(We will use your contact information for the sole purpose of sending you a copy of the research report, we will not share your data with anyone outside the project team).

Appendix C: Additional results

Table C.1: Results t-tests external market factors

Item[a]	Canada			Ireland		
	Average score	Standard deviation	t-value	Average score	Standard deviation	t-value
Consumer demand for animal welfare is a threat	3.74	1.96	-0.79	3.80	1.95	-0.54
Consumer demand for a certain attribute (e.g., tenderness) is an opportunity	5.59	1.07	***13.50	5.47	1.28	***8.12
Consumer demand for grass-fed and/or pasture-fed is a threat	2.92	1.26	***-4.13	-	-	-
Consumer demand for grass-fed and/or pasture-fed is an opportunity	-	-	-	6.40	0.77	***39.36
Consumer demand for beef from a certain breed (e.g., Angus, Hereford) is an opportunity	4.85	1.50	***3.98	5.20	1.65	***4.57
Consumer demand for organic beef is an opportunity	4.00	1.82	0.01	4.43	1.52	1.67
Climate change is a threat	3.69	1.73	-1.06	5.60	1.40	***7.89
US market trends and regulations are a threat	4.92	1.64	***3.91	-	-	-
Brexit, the future of EU direct payments and other EU regulations are a threat	-	-	-	6.17	1.15	***15.86
Federal and provincial regulations are a threat	4.73	1.63	***3.12	-	-	-
Export and trade agreements (e.g., CETA) are an opportunity	5.74	0.85	***22.90	5.87	1.43	***9.25

* indicates significance at 10% level   ** indicates significance at 5% level   *** indicates significance at 1% level

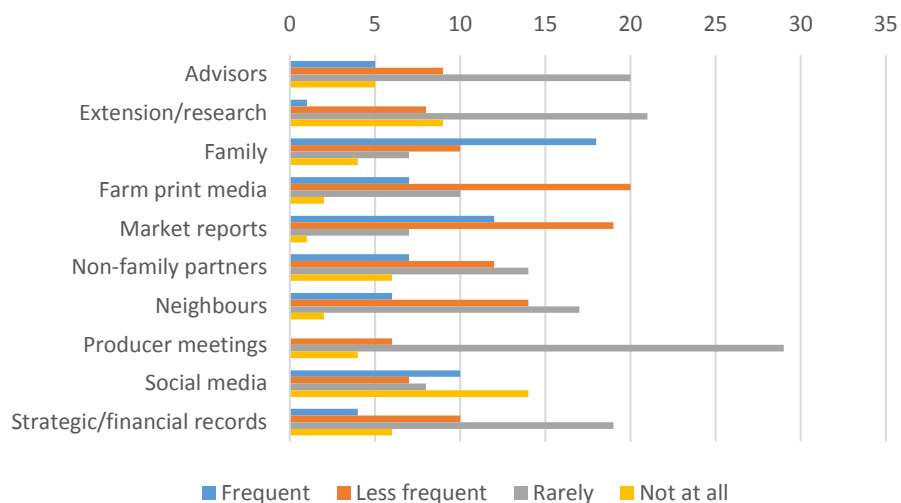[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

Figure C.1: Use of information sources for buying decisions - Canada
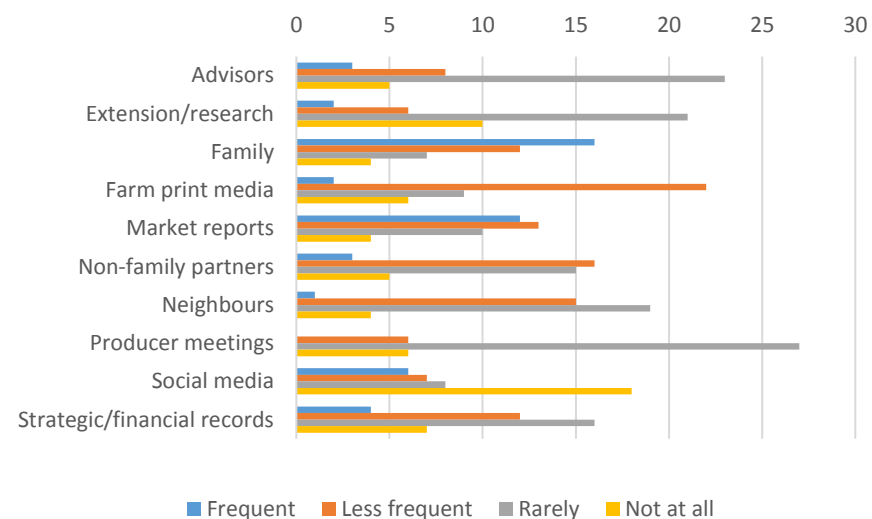

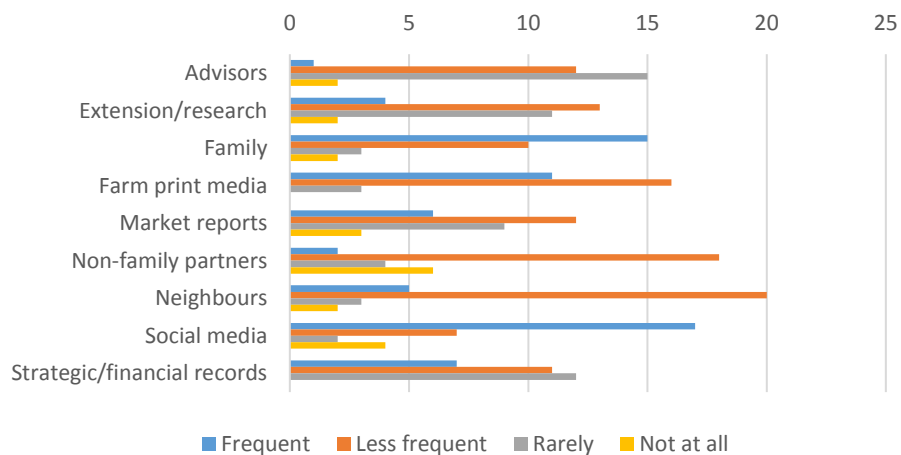Figure C.2: Use of information sources for operational decisions - Canada

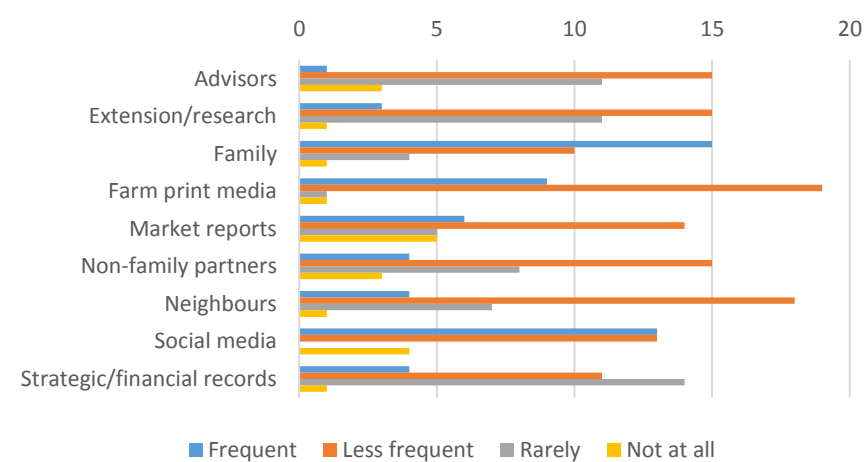Figure C.3: Use of information sources for buying decisions - Ireland

Figure C.4: Use of information sources for operational decisions - Ireland

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Table C.2: Results t-tests producer decision-making items

Item[a]	Canada			Ireland		
Good business decision-making …	Average score	Standard deviation	t-value	Average score	Standard deviation	t-value
… means keeping with the same production methods that have stood the test of time	3.36	1.55	**-2.35	3.40	1.57	*-1.91
… is impacted by what is going on at the time on the farm	4.82	1.67	***3.38	5.03	1.40	***4.74
… means being prepared to give it a go and take risks in changing production systems, technologies and marketing approaches	5.49	1.32	***9.05	5.60	0.86	***17.51
… means that in times of business challenges I rely on experience rather than external information	4.03	1.50	0.12	4.17	1.29	0.75
… means understanding sources of risk and what can be done to reduce their impact	6.03	1.14	***16.85	6.13	0.82	***28.90
… means being able to learn from experience, mistakes and failures	6.21	1.10	***19.81	6.17	0.79	***31.74
… means investigating new production or farming methods	5.92	1.01	***19.19	6.00	0.69	***36.86
… means being up-to-date with the current condition of the farm in its totality	6.23	0.74	***43.51	5.93	1.11	***14.34
… means being able to predict product prices into the foreseeable future, or at least understanding the factors that determine the prices, and understand market requirements	5.46	1.35	***8.50	5.47	1.57	***6.12
… means being able to look ahead and anticipate any likely problems, needs and opportunities	5.82	1.12	***14.94	6.13	0.78	***32.28

* indicates significance at 10% level   ** indicates significance at 5% level   *** indicates significance at 1% level
[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree

Table C.3: Results t-tests market orientation items

Item[a]	Canada			Ireland		
	Average score	Standard deviation	t-value	Average score	Standard deviation	t-value
IG1: The beef industry surveys end consumers at least once a year to assess the perceived quality of beef products	4.44	1.57	*1.85	3.97	1.45	-0.10
IG2: Within the beef industry, market intelligence on competitors is generated independently by several organizations	4.95	1.21	***5.93	4.53	1.14	**2.94
IG3: The beef industry does not periodically review the likely effect of changes in business environment on its consumers	3.54	1.29	*-2.01	4.33	1.63	1.19
IG4: Within the beef industry, general macroeconomic information is frequently collected and evaluated	5.36	1.37	***7.70	4.43	1.72	1.47
IG5: Within the beef industry, information regarding general social trends that might affect its business is not collected and evaluated	3.74	1.48	-1.02	4.17	1.53	0.63
IG6: Within the beef industry, time is spent with each other to learn more about various aspects of one another's business	4.03	1.72	0.11	3.80	1.79	-0.58
ID 1: Marketing personnel in the beef industry do not spend time discussing consumers' future demands with producers	4.08	1.40	0.37	5.00	1.66	***3.70
ID 2: Within the beef industry, business information relating to its consumers is periodically circulated among each other	4.67	1.44	***3.21	3.83	1.60	-0.54
ID 3: The beef industry does not have industry-wide meetings very often to discuss market trends and developments	3.69	1.59	-1.14	5.23	1.55	***5.11
ID 4: Researchers in the beef industry spend a lot of time sharing information about new production technologies with producers	4.38	1.41	*1.83	4.67	1.65	**2.41
ID 5: Market information does not spread quickly through all organizations in the beef industry	3.85	1.80	-0.51	5.37	1.65	***5.31
IR 1: The beef industry tends to ignore changes in its consumers' product demands	4.08	1.63	0.31	4.10	1.58	0.37
IR 2: The products the beef industry sells are more driven by supply than real market demands	4.03	1.44	0.13	5.20	1.47	***5.28
IR 3: The beef industry is slow to adopt new practices and develop new products	4.15	1.71	0.59	4.63	1.90	*1.94

IR 4: If a major competitor were to launch an intensive campaign targeted at its consumers, the beef industry would implement a response immediately	3.64	1.50	-1.40	4.17	1.64	0.59
IR 5: If the beef industry came up with a great marketing plan following a competitor's threat, it probably would not be able to implement it in a timely fashion	4.38	1.46	*1.76	4.17	1.60	0.60
IR 6: The beef industry tends to take longer than its competitors to respond to a change in agricultural, environmental and trade policy	3.97	1.40	-0.10	4.40	1.69	1.37
MI 1: The beef industry currently makes use of market intelligence to improve its competitive position	4.74	1.12	***4.98	4.90	1.09	***5.63
MI 2: The beef industry needs to make use of market intelligence in the future in order to deal with market challenges	5.74	0.99	***17.30	6.00	1.17	***13.71

* indicates significance at 10% level   ** indicates significance at 5% level   *** indicates significance at 1% level

[a] The Likert scale ranges from 1 = strongly disagree to 7 = strongly agree
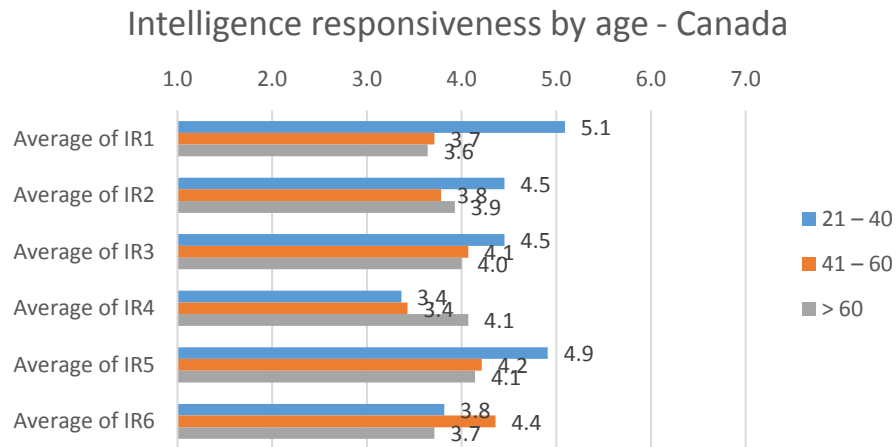
Figure C.5: Results intelligence responsiveness items by age – Canada
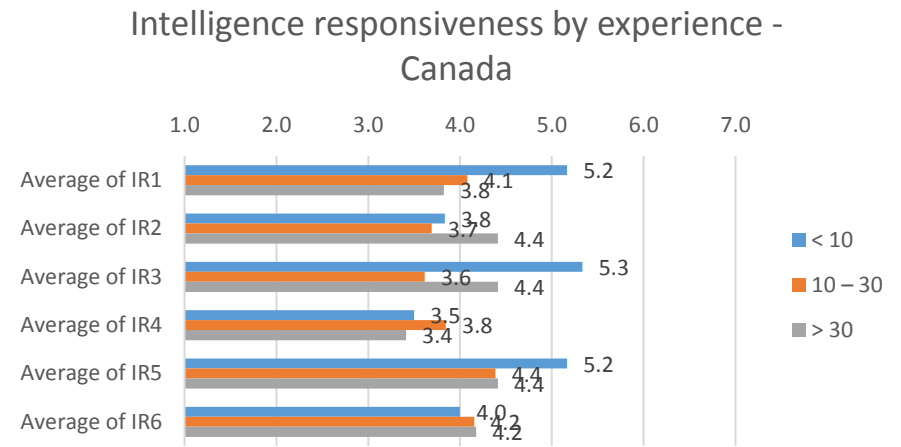
Figure C.6: Results intelligence responsiveness items by experience - Canada
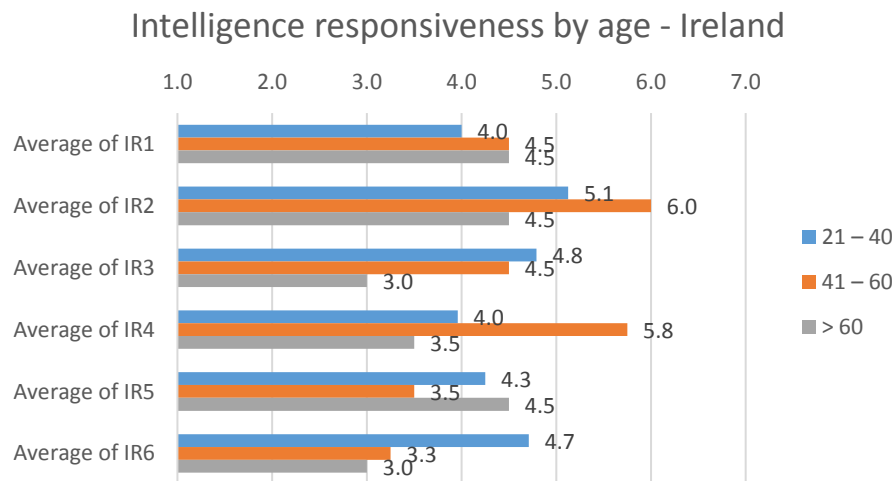
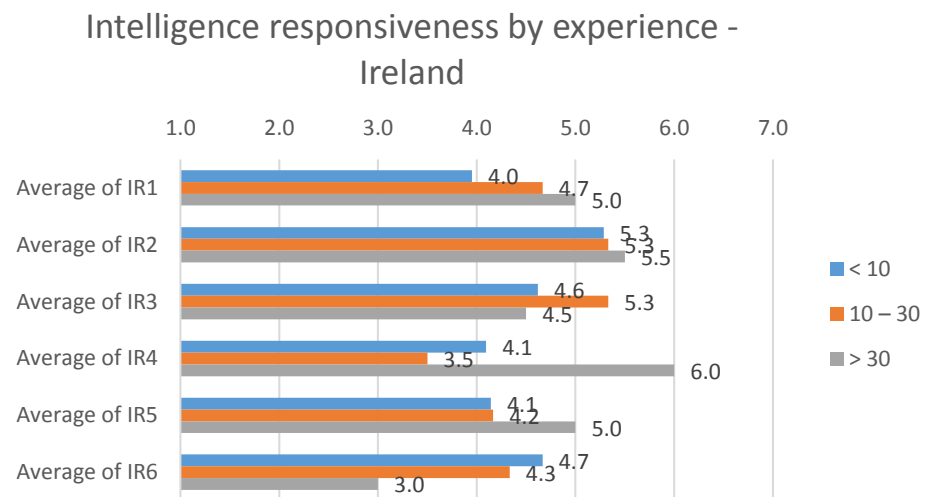Figure C.7: Results intelligence responsiveness items by age – Ireland

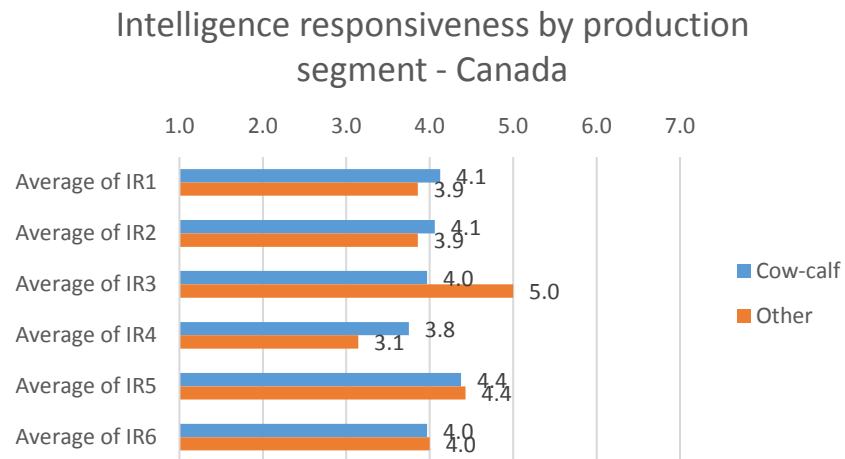Figure C.8: Results intelligence responsiveness items by experience - Ireland

Figure C.9: Results intelligence responsiveness by production segment - Canada
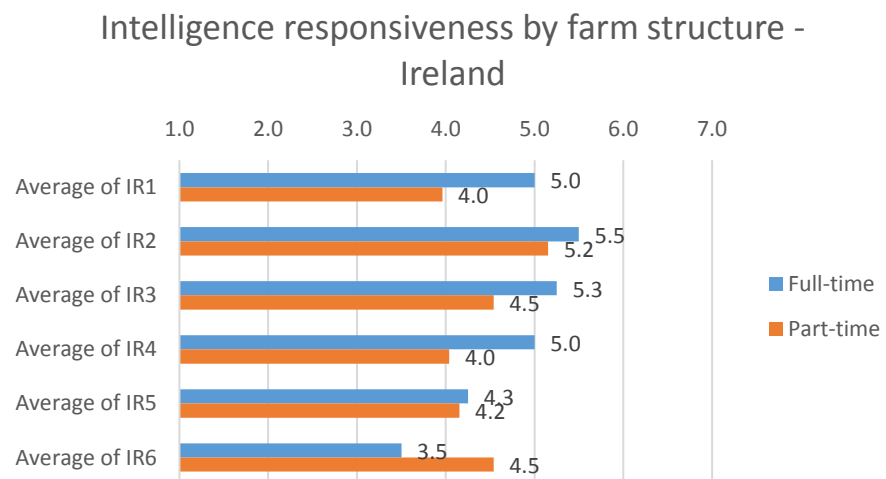

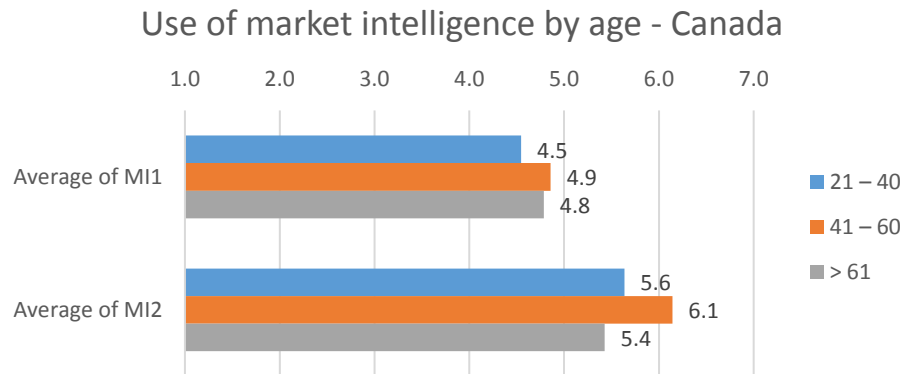Figure C.10: Results intelligence responsiveness by farm structure - Ireland

Use of market intelligence by age - Canada

Figure C.11: Results use of market intelligence by age - Canada

Use of market intelligence by experience - Canada
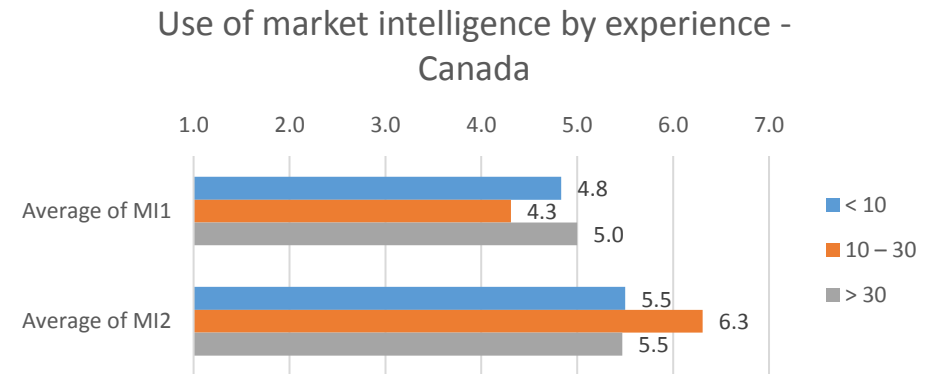
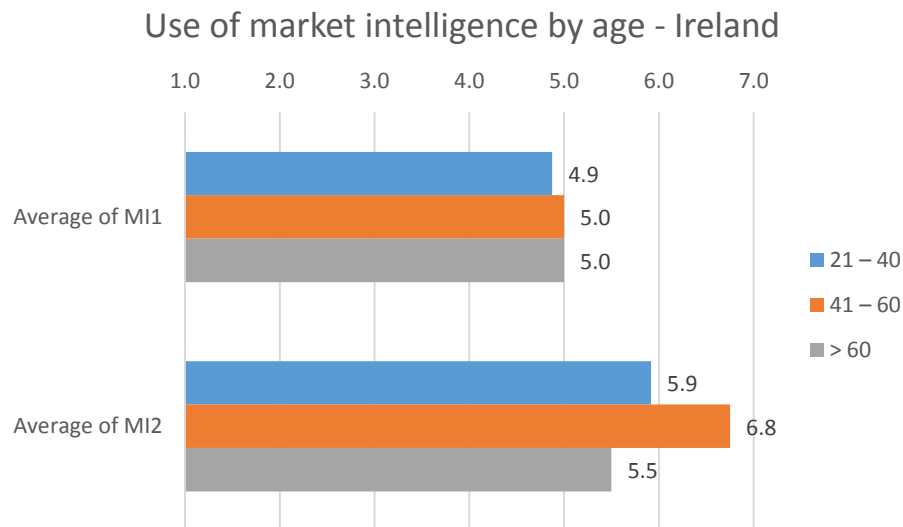Figure C.12: Results use of market intelligence by experience - Canada

Use of market intelligence by age - Ireland

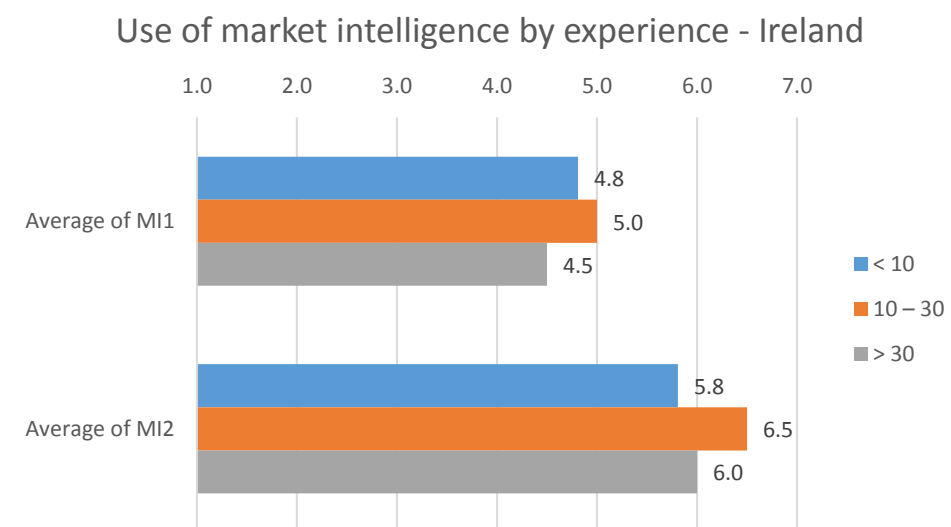Figure C.13: Results use of market intelligence by age – Ireland

Use of market intelligence by experience - Ireland

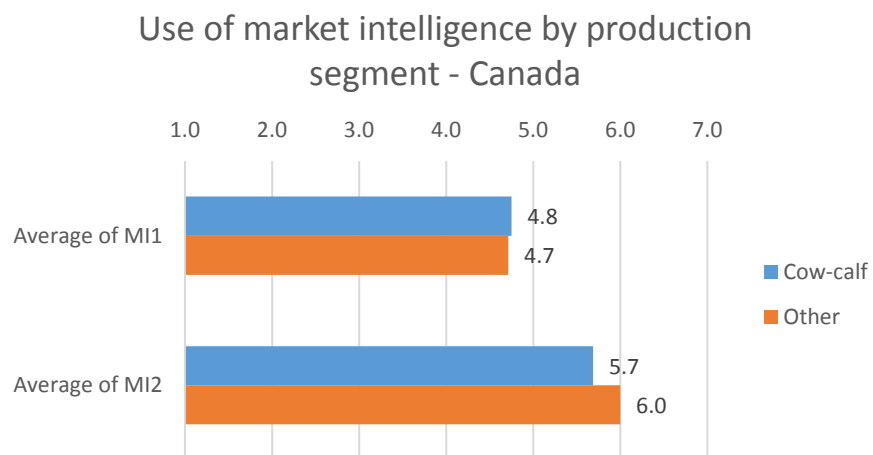Figure C.14: Results use of market intelligence by experience - Ireland

Figure C.15: Results use of market intelligence by production segment – Canada
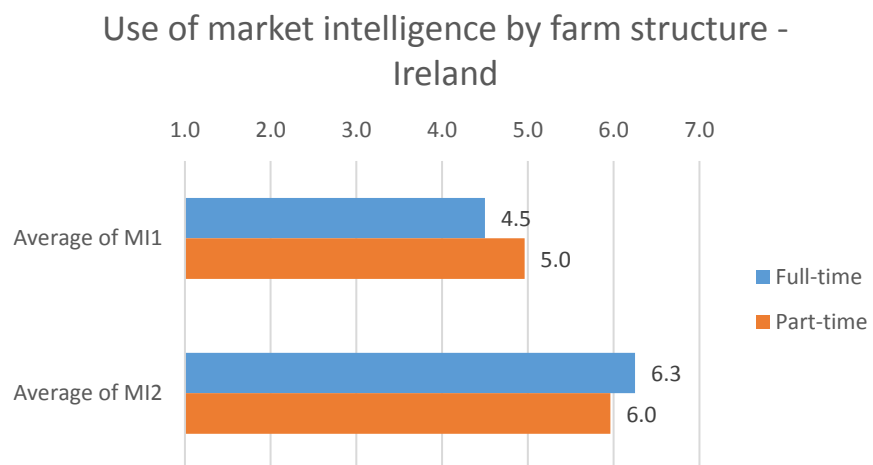

Figure C.16: Results use of market intelligence by farm structure - Ireland

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