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Analysis of value added meat product choice behaviour by Canadian households

by

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Dedication

This thesis is dedicated to my parents. I would not have made it this far in my life without their endless love, encouragement and support over the years.

Abstract

This study focuses on the variability of Canadian's value added meat purchase patterns by animal species, by level of processing, by branding and by grocery store chains.

The results highlight that meat price, advertising and household socio-demographic characteristics and regional segments are strongly related to meat demand. The findings also indicate that there is no one correct pattern of meat product development across animal products from different species. In addition grocery store meat purchase exhibits little store loyalty – most households purchase meat at more than one store chain regularly.

The implications of the study suggest the importance of meat marketing segmentation by socioeconomic and household demographic factors in the development of marketing programs and product promotion for the food industry in general and meat industry to expand sales by targeting marketing strategies. Public health implications include the fact that habit persistence is important and likely an impediment to behaviour changes.

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Chapter 1: Background

1.1 Introduction

Canadian meat demand is important to the Canadian economy. In 2008, Canadian consumers spent around $69 billion on food in retail stores (Statistics Canada, 2009). As the primary source of fat for both children and adults, meat is an important component in diets (Statistics Canada, 2007). Changes in meat demand can have an impact on all segments of the food chain, which include agricultural input suppliers, food producers, processors, and distributors (Agriculture and Agri-Food Canada, 2009). Thus, understanding the factors that are influencing meat demand in Canada is important for the Canadian agricultural sector. Moreover understanding consumer meat preferences in general is increasingly important in the context of health concerns, animal disease and food safety outbreaks.

1.2 The Canadian Meat Industry—An Overview

The meat and poultry industry is positioned as one of Canada's most important manufacturing industries (Agriculture and Agri-Food Canada, 2009). In 2008, Canada's annual shipments from the meat industry were $16.2 billion, which ranked as the largest sector of the Canadian food manufacturing industry. Various meat products, including fresh/frozen, semi-processed, and processed meats, as well as sausage and deli meats are well established and produced by Canada's meat processing companies. An increasing number of meat producers are expanding into new markets for organic and value added meat products (Agriculture and Agri-Food Canada, 2009).

Furthermore, the meat industry has undergone significant structural change due to agricultural industrialization in recent decades. Cost advantage strategies (low cost) and more intensive product differentiation are two strategies being pursued in the current meat industry. Intensification, concentration, and specialization are three

structural forces behind meat industrialization (Bowler, 1985). For example, Stull and Broadway (2004) suggest that industrialization in the meat industry is focused on large volume production of uniform products at the lowest possible price, resulting in high-efficiency, high-volume cattle slaughter-dressing facilities.

1.3 Food Retailing—Store and Brand Choices

Retailers are the closest and most frequent point of contact for consumers to the meat industry and they can directly influence household meat purchasing. The competitive landscape in retailing has changed over the past 40 years in Canada. The number of grocery stores has been declining whereas the size of the existing stores has been increasing, partially due to new entry by so-called supercenters e.g. Wal-Mart, (Agriculture and Agri-Food Canada, 2008). In 2005 Canada's food retail sector had sales of about $71 billion for food and non-alcoholic beverages. Approximately three quarters of the sales were distributed through large grocery store chains (e.g. Loblaw, Sobeys, and Safeway) and traditional grocery stores. Other format distributers, such as discount clubs (e.g. Costco and Sam's Club), large mass merchandising chains (e.g. Wal-Mart), and convenience stores (e.g. Mac's, 711) have established a significant presence (27 per cent) of food sales in Canada (Agriculture and Agri-Food Canada, 2008).

Meanwhile, the degree of value adding and product differentiation has been increasing, for example, households are able to choose between national brands and private labels (store brands) of similar products (Sethuraman, 2003; Bonfrer and Chintagunta, 2004; Debbie, 2004; Hansen et al., 2006; Hassan and Monier-Dilhan, 2006; Tyagi, 2006; Ailawadi et al., 2008). The private label (store brand) products mainly consist of two categories: "premium" private labels such as President's Choice (carried by Loblaw store chains) or Our Compliments (carried by Sobeys store chains), and "generic" such as store brand products. Private label brands have become a primary tool for grocery retailers to differentiate themselves from competition in retailing. The trend towards private label brand development is accelerating in all consumer product segments due to profit potential.

1.4 Consumer Demand and Value added Meat

Changing consumer demand is one of the most important drivers behind the challenges and opportunities that are facing the agriculture and agri-food sector in Canada (Agriculture and Agri-Food Canada, 2009). Several studies have documented changes in meat consumption in the U.S over the past 30 years (Chavas, 1983; Moschini and Meilke, 1989; Thurman, 1987). Similar patterns can be observed in Canada. From 1970 to 2001, Canadian preferences of meat consumers shifted from pork and beef to poultry meats (Chen and Veeman, 1991; Reynolds and Goddard, 1991).

Table 1.1 Meat consumption trends in Canada from 1965 to 2005

Year	*Chicken*	*Pork*	*Beef*
Per capita consumption (kg)			
1965	10.0	18.6	28.8
1975	12.9	19.9	36.0
1985	19.3	22.0	28.0
1995	24.8	21.1	23.1
2005	30.6	17.4	23.2
Annual growth rates, per cent			
1965-2005	2.8	-0.2	-0.5

Source: Statistics Canada, CANSIM table 002-0011, accessed on March, 25th, 2010. Available from: http://cansim2.statcan.gc.ca/cgi-win/cnsmcgi.pgm?Lang=E&ArrayId=20011&Array_Pick=1&RootDir=CII/&ResultTemplate=CII.

Per capita growth in chicken consumption has been higher than for pork and beef products since early 1970. Pork and beef consumption peaked in 1976 when they accounted for 56 per cent of all Canadian meat consumption, while the share of chicken meats was 13.0 per cent (Table 1.1). The consumption share of beef and pork meats fell to 40.6 per cent while the consumption share of chicken rose to 30.6 per

cent by 2005. From 1975 to 2005, beef appeared to have lost the biggest share of Canadian meat consumption falling from 36.0 per cent to 23.2 per cent while chicken's share more than doubled from 12.9 per cent to 30.6 per cent (Agriculture and Agri-Food Canada, 2009). Consumption of chicken has increased by 136 per cent from 12.9 kg in 1975 to 30.6 kg in 2005 (Statistics Canada, 2008). This growth in the consumption of chicken could be a result of Canadian consumers' health perceptions.

Another factor that potentially affects the demand for meat products is the changes in Canadian consumer dietary patterns over the past forty years. There is an increase in the demand for ready-to-eat convenience and further processed food products (Agriculture and Agri-Food Canada, 2008). In the 2006 Canadian Consumer Perceptions of Food Safety and Quality survey (Agriculture and Agri-Food Canada, 2007), consumer perceptions of "nutritional value", "ingredients in the food", "brand or company name" and "convenience" were found to be closely linked to food at home consumption. Thus, more new meat products for the market are concentrating on convenience, variety, health and safety (See Table 1.2 below). The analysis is for U.S. market data but similar trends have been observed in Canada. Furthermore, consumers are becoming more aware of the production processes that go into their food. They are influenced by the origins of their food, how it is grown, processed and prepared.

Table 1.2 Attributes of 33 new meat products to market

Attributes	Numbers	Percentage
Convenience	30 of 33	91%
Natural	16 of 33	48%
Health benefits	17 of 33	52%
Easy cooking directions	20 of 33	61%
Better/unique tasting	21 of 33	64%
Others	5 of 33	15%

Source: Magazine of Meatingplace and Poultry, issues from 2006.1 to 2008.5, accessed in Sep. 2008.

1.5 Factors Affecting Meat Demand

Aggregate consumers' food demand is potentially influenced by factors such as population growth, household demographic profiles, changing household structure, changing consumer attitudes, meat advertising, food safety and growth of the economy (Verbeke et al., 2000; Reynolds-Zayak, 2004). Understanding these factors affecting meat demand is important for current household meat demand analysis.

1.5.1 Household Income and Food Expenditures

Food consumption is closely related to the household economy. Household income strongly influences food choices and food demand (Stewart and Blisard, 2008). Households will spend more of their food dollar on meat purchasing as they have more income, as long as meat remains a normal good. Historical data suggests, as household income increases, the nominal level of spending on food increases. From 1961 to 2005, as per capita incomes increased, meat consumption increased at an annual rate of 1 per cent (Statistics Canada, 2008).

1.5.2 Household Size

An important trend having an impact on meat demand is the growth of smaller households. Since 1966, the average number of Canadians per household has been continually decreasing (Statistics Canada, 2001). An increasing number of Canadian have chosen to live alone and in the case of married couples, they choose to live without children, thus the demand for smaller servings (package sizes) and foods that require minimal preparation (or are further processed) is increasing.

1.5.3 Population, Immigration, Education

Growth in food consumption is closely linked to population growth (Boserup, 1989). Canada's population continues to become older and more ethnically diverse. Canadian food patterns are also influenced by immigrants with different dietary. Moreover education plays a crucial role in the food demand by households as well.

1.5.4 Health and Nutrition

Health-related attitudes can also influence food demand (Steptoe et al., 1995; Geeroms et al., 2008; Hailu et al., 2009). Some research notes that meat purchasing may have certain relationships with colorectal cancer risk (Norat and Riboli, 2001) and breast and prostate cancers (Biesalski, 2002). Thus, a significant proportion of consumers are aware of the health benefits and risks along with diet patterns. The 2006 Consumer Perceptions of Food Safety and Quality survey (Agriculture and Agri-Food Canada, 2007) also showed that 31 percent of consumers ranked nutrition as a top of mind issue for food-at-home consumption as compared to 24 percent in 2004.

1.5.5 Food Safety

Food safety has become one of consumers' top concerns. There have been disease outbreaks and food recall issues, such as BSE (Bovine spongiform encephalopathy), Avian Flu, foot-and-mouth, Escherichia Coli O157, etc. in the beef cattle and poultry industries (Canadian Food Inspection Agency, 2007, Table 1.3). The concerns about food safety have increased over time following incidents of contaminated meat products/meat recalls in the U.S. and Canada (Doyle and Erickson, 2006). Thus food safety may have impacts on consumers' food demand and become more and more important in consumers' decision making processes. Meanwhile foodborne diseases can be costly as a serious public health problem (de Jonge et al., 2008). There is a growing interest in determining the effects of food safety concerns on meat demand. Therefore, understanding consumers' responses to food safety issues plays an important part in establishing market strategies and meat industry policies.

Table 1.3 2000-2007 food recalls and allergy alerts from CFIA by meat category

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Beef	2	11	10	16	4	4	0	11
General	0	11	8	11	9	4	5	9
Pork	5	3	1	0	5	0	1	4
Poultry	4	3	1	4	2	3	1	4
Seafood	1	7	9	9	2	0	4	5
Total	13	35	28	40	22	11	11	33

Source: Canadian Food Inspection Agency (http://www.inspection.gc.ca, accessed on Sep. 2008.

1.5.6 Advertising

Many studies have focused on the effects of advertising on consumers' meat consumption. Different types of advertising, including both generic and brand advertising, have been examined in meat demand analyses (Goddard, 1992; Verbeke and Ward, 2001; Wang, 2002; Freebairn, 2004; Lerohl et al., 2004; Halford et al., 2007; Amrouche et al., 2008; Chioveanu, 2008; Salma et al., 2009). Although some debate on the effects of advertising on market performance still exists in the economics literature, advertising is a marketing strategy used by the food industry to increase competitiveness and increase market share of a specific branded food product or to introduce new products to increase sales. Meanwhile generic advertising (for example, on the meat from a certain animal species) has also been used as a popular tool to combat health perceptions of meat.

1.6 Economic Problem

The Canadian meat industry faces many challenges and it is important to understand the links between various factors and the industry, such as industry consolidation, value added product development, product substitution across meat types, changing household demographics and food safety and health perception, etc. From a policy

perspective, all of these issues can affect consumer welfare, industry profitability and possibly result in a change in policies.

On the other hand, from an industry marketing prospective, issues such as private label introduction, consumers' store and brand switching behaviour, meat type substitution, changing household demographics etc. will have an impact on the development of a marketing strategy. Firms will also be interested in how consumers respond to new products, advertising and other marketing promotions. These factors must be enunciated to understand how the Canadian meat industry can move forward with higher levels of customer satisfaction and value. The industry requires evolution to meet consumers' changing meat demand, especially for specialized meat products.

In this vein understanding consumers' meat demand and behaviour, identifying historical and current trends in household demographics and testing for significant changes in household characteristics are all important. For example, households' demographics and perceptions play a significant role in their store/brand and meat type choice behaviour. It is important to analyze how consumers determine their consumption decisions for the purchase of meat products with different nutrition convenience attributes and brands. It is also important to understand, for policy formation, how consumers choose between general grocery stores (including traditional retail cooperatives, e.g. Federated Co-operatives, etc.) and multinational/regional grocery chains and discount stores (e.g. Loblaw, Metro, Safeway, etc.) since successful product development and marketing are based on the supply chain. Understanding how households spend their food dollars on meat products when their income increases/decreases is key to product development success.

Not only livestock producers, but also processors and retailers, need to understand meat demand changes in light of changing health perceptions, food safety concerns and trust in brands and stores. This knowledge is required in order to predict changes in demand and develop effective new products and marketing strategies that respond to changing consumer needs, feeding into new product development; evaluating existing and potential policy options (such as, whether consumers respond as

expected), which ultimately may increase the value of total sales and affect public health.

1.7 Objectives

The overall objective of the study is to evaluate the structure of consumer meat purchase behaviour (meat type choices by level of processing, by store choices as well as by national/store brand choices) in order to improve understanding of recent food-at-home consumption patterns and discern new trends in meat demand, potentially identifying factors that could be used to add value to meat and livestock production. Meat processors usually face two alternatives for branding policy: a given meat manufacturer or processor either becomes a national company and sells meat products under its own brands (namely national brands), or cooperates with grocery store chains and produces meat products sold under the name of a certain store chain. Information related to this decision is related to the hierarchy of consumers' decision making: the process of selection decision among stores, meat by types (fresh, semi- and fully processed meat) and meat by brands (national brands or private labels). For example, how are consumers' brand choices (national brands vs. private labels) linked to store choices and subsequent in-store expenditure decisions? Which shopping scenario will drive store traffic in terms of volume of sales? Thus understanding the structure is important for the industry and meat producers to know where to introduce new products and how to increase sales of meat products.

Specifically, in the study demographic and regional segments that historically and currently are purchasing different types and different levels of processing of meat will be identified by segmenting products on total expenditure and share of meat expenditure. This study also focuses on the trends in meat demand over time, change in demand among different meat products, choices between grocery stores and national/store brands. In order to focus on temporal and spatial patterns (e.g. differences between similar households across geographic regions, as well as differences within individual households over time), ACNielsen Homescan™ panel data is used as the primary data source for this study. A sample consisting of

households that stayed in the ACNielsen Homescan™ panel over the period 2002 to 2007 is selected for analysis. To conduct a manageable analysis and comparison, two regions in Canada, Ontario and Alberta, were chosen due to the fact that Ontario is the most populous province (which could have a large representative effect) and the fact that Alberta is the center of Canada's beef industry and is so significant in livestock production but has not traditionally been as significant in value added meat processing. Information on marketing variables such as market shares by grocery store chains will also be presented. Moreover the study will focus on household store and brand choice analysis focusing on value added meat purchasing.

Specifically the research objectives for the study are threefold:

1. Household level purchase data over the period 2002-2007 and Nielsen Media Measurement™ advertising data (2002-2007) is used to:
   - Understand how consumers make purchase decisions around fresh, semi-processed and fully processed products for four meat type categories: beef, pork, poultry and others (e.g. mainly seafood products)
   - Quantify the impacts of demographic and regional characteristic differences on meat purchase behaviour, and these differences in the behaviour across meat types.

2. Household level meat purchase data from 2002-2007 and Nielsen Media Measurement™ store advertising data (1999-2005) is used to:
   - Find out whether Canadian consumers show consistency in purchasing patterns. Are they loyal to particular stores? Does this vary by region, by demographics, by store availability, is store advertising a factor?

3. Household level meat purchase data from 2002-2007 and Nielsen Media Measurement™ advertising data (2002-2007) is used to:
   - Identify how consumers make decisions about private label versus national brand products in the fully processed meat category (pork, poultry and other

meats). Is product and brand advertising a factor? Does behaviour vary regionally and by demographics?

1.8 Thesis Structure

The chapters of the thesis lay the basic groundwork of the study, present the modeling framework and key results, and discuss relevant policy considerations and future research extensions. The thesis structure is as below,

Chapter 1: Background

Chapter 2: Literature Review

Chapter 3: Methods and Data Descriptive Statistics

Chapter 4: Canadian Value Added Meat Demand Analysis

Chapter 5: Canadian Store Choice Analysis

Chapter 6: National and Store Brand Choice Analysis

Chapter 7: Summary and Conclusions

Chapter 2: Literature Review

2.1 Introduction

The meat market is no different than any other sector of the grocery market: the degree of product differentiation has been increasing as a "value adding" market strategy, both national brands and private label brands are being developed to appeal to the consumers' desire for convenience, health, production and environmental attributes (Connor and Peterson, 1992; Chintagunta, 1993; Salvanes and DeVoretz, 1997; Chintagunta et al., 2001; Baltas and Papastathopoulou, 2003; Grunert et al., 2004; Verbeke and Vackier, 2004; Dolekoglu et al., 2008; Martinez and Montaner, 2008; Reicks et al., 2008; Salma et al., 2009). Understanding the factors that influence consumers' meat product preferences is important for meat manufacturers who wish to add value to their firms' performance and increase market share. This knowledge is required in order to predict changes in demand and develop new products and marketing strategies that respond to changing consumer needs.

The focus of the study is on how meat consumers make their decision to purchase meat products. Specifically, the first objective of the study is to analyze the impacts of household demographic and regional characteristic differences on meat purchase behaviour by type of meat products (fresh, semi-processed and fully processed). The second and third objectives are to investigate the role of household demographic characteristics, shopping trips, and other information such as advertising in influencing meat purchase decisions around store choice and private label and national brand choices. The research will be based on an exploration of consumer theory and empirical meat demand analysis, and on a fundamental framework of different demand functional forms, types of demand models, and empirical specifications of demand analysis.

To achieve the goals of this empirical work in applied economics, this chapter is devoted to an extensive literature review based on prior research on consumer

demand issues and related studies which will assist in proper placement of this study. Two main streams of literature, both the economics literature and recent marketing literature on consumer behaviour are reviewed in the chapter.

2.2 Overview of Value Added Agricultural Products

2.2.1 Value Added Definition and Value Added Agricultural Products

In today's agricultural and food industry, "value added" is a very broad concept with numerous definitions, describing many attributes of food products such as processed, re-cooked, healthy, convenient, pre-packaged, etc. The term "value added" can be interpreted in many ways (Kinsey et al., 1993; Fairbairn and Gustafson, 2004; Martinez et al., 2007; Keijbets, 2008). Value adding can be found in most agricultural products including hogs, cattle, bison, fish, eggs, crops, grains, potatoes, carrots, beans, tomatoes, corn, milk and cheeses, etc. (Coltrain et al., 2000).

Statistics Canada (2007) defines value added as "the value that is added to a product by, for instance, producing baked goods from flour, sugar, salt, yeast, eggs, water, and vegetable oils." At an industry level, Statistics Canada (2009) measures "net value added" as "agriculture's contribution to the national economy's production of goods and services. It is derived by calculating the total value of agricultural sector production, including program payments, and subtracting the related costs of production (expenses on inputs, business taxes and depreciation)."

United States Department of Agriculture (USDA, 2009) defines value added products as "those changed in forms, function, or increased in their economic value and/or improved consumption appeal". The classification of value added products includes four categories "that increase the value that is realized by the producer from an agricultural commodity or product as the result of:

- A change in its physical state (a change in physical state is only achieved if the product cannot be returned to its original state.);

- Differentiated production or marketing, as demonstrated in a business plan (the enhancement of value must be quantified by using a comparison with products produced or marketed in the standard manner, using information from the Feasibility Study and Business Plan developed for the Venture);
- Product segregation (the enhancement of value should be quantified to the extent possible by using a comparison with products marketed without segregation.); or
- The economic benefit realized from the production of farm or ranch-based (the application must explain how the renewable energy will be generated on a Farm or a Ranch owned or leased by the owners of the Venture.) " (Source: *USDA Rural Development Value-Added Producer Grants*. Available from http://www.rurdev.usda.gov/rbs/coops/vadg.htm , accessed April 15, 2009)

Parkland Economic Development Practitioners Group in Canada (2005) defines "a value added product is one that has greater value than the sum of the product's parts." They use the primary agricultural product of wheat as an example. After steps of processing, wheat can be milled and made into flour, it then can be made into bread. Each step is regarded as a process of value adding. The wheat is changed from a primary product to a value added product that can be more effectively utilized by consumers. The report says that "ways to add value to a product include: by cooking, churning, culturing, grinding, hulling, extracting, drying, smoking, handcrafting, spinning, weaving, labelling and packaging, etc". (Parkland Economic Development Practitioner's Group & Neechee Research Analysis, 2005, p.1)

Wood (1978) describes the concept of value added as the "wealth generated by the efforts and ingenuity of mankind" (p.1). Richards et al. (1998) view convenience, processing, and quantity as added value in foods. Coltrain et al. (2000) see "value added" as "a process of changing or transforming a product from its original state to a more valuable state with characteristics more preferred in the marketplace, such as processing wheat into flour, and into products desired by customer like bread" (p.4). Cowan (2002) defines value added as "the difference between the value of goods sold and the cost of materials or supplies used in producing them. The term is applied to

manufacturing processes where raw commodities are initially processed into intermediate goods which are then processed in further stages, adding increasing market value at each stage" (p.1). Fairbairn and Gustafson (2004) consider "value added" as "the steps that alter or add to a product or service that enhances or improves (in the opinion of the consumer) an existing product, or introduces new products or new product uses" (p.7). Many agricultural strategies and activities can be regarded as value added, such as "specialty crops, wine making, regional branding, cleaning and bagging grain, pasta processing, organic agriculture, service-embedded products and ready-to-eat convenience meals" (Fairbairn and Gustafson, 2004, p.7). Martinez et al. (2007) link the concept of "value added" to the term "branded", they think branding can add value to a product and can motivate a consumer's willingness to purchase the product. A report from the Food and Agriculture Organization of the United Nations regards the strategy of certification for agricultural products as a way of value adding in the food market (FAO, 2008).

2.2.2 Definition of Value added Meat Products

McMillin and Brock (2005) point out that value can be added at different stages in the meat system of production, distribution, and selling products at the retail level. The authors consider value added products would include "irradiated products for microbial safety, precooked products for convenience, portioned and institutional items for uniformity, and nutritionally enhanced meat for healthfulness" (p. 62). Carrboro Farmers Markets, Inc (2007) defines value added meat products as "farm produced value added meat products are further processed meat products made from raw ingredients. Farmer vendors must raise a minimum of 51 percent of the raw ingredients in a value added meat product."

One definition for value added meat products from Meat and Livestock Australia (MLA, 2008) includes:

- "Adding extra ingredients to the raw meat, such as bread crumbs for schnitzel or vegetables for stir fries
- Cooking the raw meat prior to selling, such as pre-cooked roasts

- Processing meat into small goods, such as pastrami
- Prepared products for retail such as sausages, patties or kebabs
- Packaging meat for a longer shelf life, e.g. modified atmosphere packaging" (MLA, 2008)

The classification and definition of value added meat products in this study are based on the definitions in previous studies and the availability of the data set in this study. "Value added" is defined as the level of value added processing in the meat products in this study which returns higher value in live animal pieces to primary meat producers[1]. Thus meat products are grouped into three categories: fresh, semi-processed and fully processed meat for four types of meat (beef, pork, poultry and others) according to "meat processed type" and "meat processed form" information provided by ACNielsen Homescan™ panel. Both "PRFRM" (meat processed form table, as shown in Table 2.1 below) and "PRTYP" (meat processed type table, as shown in Table 2.2 below) information are applied to meat classifications (Figure 2.1). For example, in the meat processed form table, code values like *GROUND, STEAKS* and *WHOLE* imply that the products are fresh and these are classified as non value added. On the other hand, code values like *BURGERS, SAUSAGES* and *BACON* etc. indicate the products have some level of processing and are thus value added. Information from meat processed type and meat processed form tables is used to indentify whether the products are semi-processed or fully processed. If neither category suggests processing, then the product is regarded as fresh and non value added. If either or both of the values indicate processing, then the products are defined as processed and value added. For example, if one product is in the fresh category in the "PRTYP" table, but is in the fully processed meat category in the "PRFRM" table, then it is grouped into the fully processed meat category after combining both types of category information. UPC coded and random weighted meat products are both included in the sample data.

1 It is noted that meat product price does not necessarily reflect whether the product adds value to the animal carcase.

Table 2.1 ACNielsen Homescan™ panel product processed form table (PRFRM)

Fresh meat		Semi-processed		Fully processed	
340561	ALL TYPES	363885	BACON	340537	SCALLOPINI
345061	ASSORTED	340528	SAUSAGE	340524	SCHNITZEL
340531	BACKS	356417	ALOUETTE	363886	SLICE
364811	BREAST	394361	BROCHETTE	317447	SLICES
353575	CASINGS	363900	BROCHETTES	345040	BALLS
340506	CHOPS	365095	CARVED	410596	BAVETTE
450802	CHOPS W/FILLET	425822	CHOPPETTES	129258	BITES
436511	CHUB	340555	COTTAGE ROLL	340563	BURGERS
351077	CHUNK	371000	DRUMLETS	129250	CHIPS
317632	CUBES	340558	HEAD	364953	CHOMPERS
340533	CUT UP	321308	KABOB	365082	CRISPS
129253	DICED	340509	KABOBS	364861	CUTLET
340530	DRUMSTICKS	364924	MEATBALL	340508	CUTLETS
345070	ESCALOPE	340536	MEATBALLS	436512	CUTLETS/DRUMMETTES
340513	FILLETS	340526	ROULADEN	365089	DINO SNACKS
365032	FINGERLINGS	345006	SALT	364975	DUMPLING
353256	FLAP	345046	SAUSAGE MEAT	340554	FINGERS
129261	GROUND	340748	SAUSAGES	365090	FLINGS
340527	LONDON BROIL	363895	SKEWERS	365084	FRANKFURTERS
340539	MEDALLIONS	363901	SOUVLAKI	365046	FRIES
340560	MINCED	363898	STIRFRY	364960	FRITTERS
129263	MINI			340562	MEATLOAF
129227	N/A			340517	NUGGETS
129239	NOT APPLICABLE			344949	PATTIES
468358	OSSO BUCCO			340521	PAUPIETTES
317578	PIECES			365129	PEROGIES
350888	PORTION			346623	POPCORN
428240	RIB FINGERS			340540	SATAY
352967	RIB STRIP			356405	SAUSAGE CHAPLET
345031	RIBLETS			355660	SAUSAGE KABOB
340518	RIBS			345044	SAUSAGE PATTIES
370999	RINGOS			364961	SNACKOSAURS
365036	RINGS			365094	SNAKE BITES
340507	ROAST			410823	SPIEDINI
319240	ROLL			365120	SPIRALS
356409	ROSETTE			364979	STEAKETTE
372928	SCRUNCHIONS			340552	STEW
353574	SLAB			129249	STICKS
340516	SPLIT			365031	STIX
356958	SPLIT/TIPPED			129260	STRIPS
340512	STEAK			364931	TEAZERS
375130	STEAK CUBED			357815	TENDERS
372576	STEAK/ROAST			340515	TOURNEDOS
363894	STEAKS			129242	SLICED
364111	UNSPECIFIED			351060	SLICED/PIECE
129243	WHOLE				
364830	WINGS				

Source: ACNielsen Homescan™ panel.

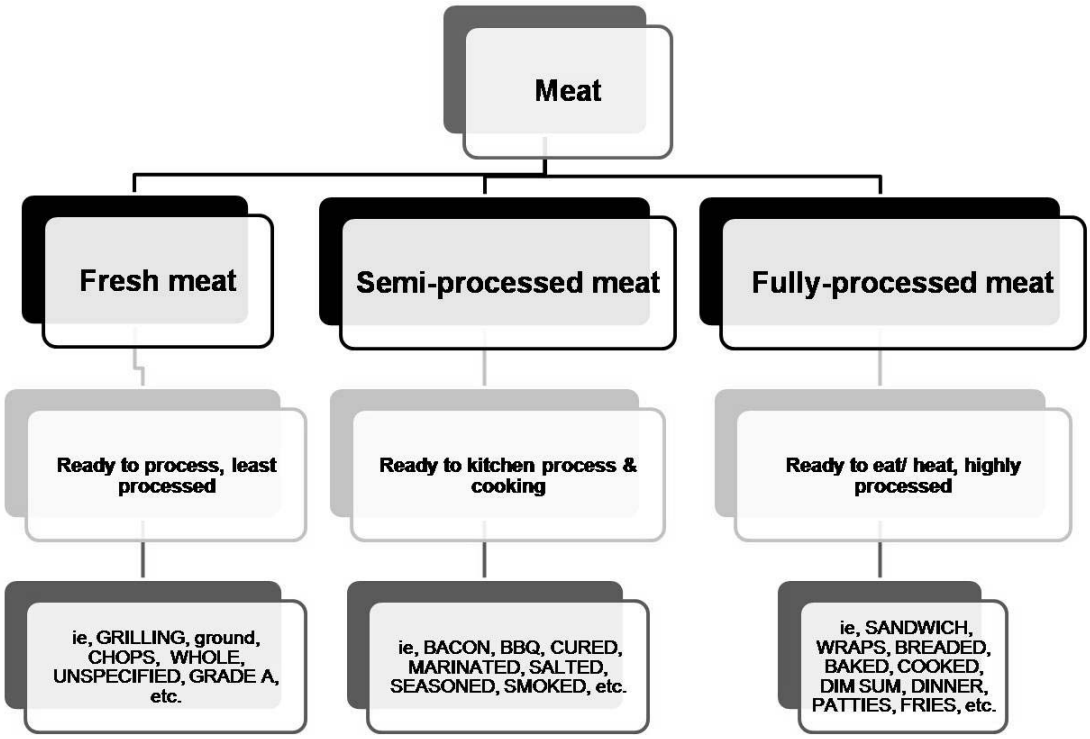
Table 2.2 ACNielsen Homescan™ panel meat processed type table (PRTYP)

Fresh meat		Semi-processed		Fully processed	
343873	AIR CHILLED	139657	BASTED	370997	BAKED
345502	ANGUS	345068	BASTED/GRADE A	368110	BATTERED
446497	ANGUS GRADE AAA	355657	BASTED/STUFFED	340868	BREADED
344999	BRAISING	139693	BBQ	347249	BREADED/FAST FRY
355289	BROILER	349972	BRAISING/SEASONED	361541	BREADED/GRAIN FED
363270	BROILER/GRADE A	345060	CORNED	353577	BREADED/TENDERIZED
310656	BUTTERFLIED	139673	CORNMEALED	368098	BURRITOS
413242	CALIFORNIA STYLE	345100	CURED	368096	CASSEROLE
454407	CANADIAN ANGUS	345099	CURED/CORNMEAL	355665	CHICKEN FRIED
346191	CUBED	139670	DELICATED	45337	CHILI
99976	DRY	350881	DOUBLE SMOKED	368108	CHIMICHANGAS
139654	FAST FRY	356688	FRENCH STYLE/MARINTD	368113	COOKED
139692	FREE RANGE	363013	FRENCH STYLE/SEASOND	368095	CORNDOGS
347426	FRENCH STYLE	366374	FRENCHED SEASONED	139689	COUNTRY STYLE
382313	FRENCH STYLE/ANGUS	357826	FRENCHED/GRAIN FED	352675	CRISPY
139662	FRENCHED	357823	FRENCHED/SEASONED	368114	CROQUETTES
354334	FRENCHED/GRILLING	352679	GARDEN STYLE	368109	DIM SUM
139655	FRYER	356402	GRILLING/MARINATED	99973	DINNER
345065	FRYER FREE RANGE	139660	MARINATED	368104	EMPANADA
344954	FRYER GRADE A	346983	MARINATED/SEASONED	368105	ENCHILADAS
344967	FRYER/UTILITY	344974	MARINATING	139298	FAJITA
139688	FRYING	360469	MARINATING/ANGUS	368117	FILLO
344953	GRADE A	354336	MATURE/SEASONED	462862	FILO
353258	GRADE A/MARINATED	346197	PEAMEAL	368387	FRENCHED/BREADED
354339	GRADE AAA	352964	PICKLED	45315	FRIED
343879	GRAIN FED	367197	ROASTED/BASTED	368091	GRILLED
355654	GRAIN FED/TENDERIZED	345098	ROASTED/SEASONED	350884	MECHOUI
344950	GRILLING	349791	ROASTING/STUFFED	368094	PASTRY
360470	GRILLING/ANGUS	345004	SALTED	368115	PATTIES
444255	HOTEL STYLE	361539	SALTED/CURED	139219	PIE
353254	MATURE	45311	SEASONED	368107	POTSTICKER
343210	MILK FED	416019	SEASONED/ANGUS	368090	PREPARED
416020	MILK FED/HOTEL STYLE	345069	SEASONED/BBQ	368100	QUESADILLA
345007	MILK FED/TENDERIZED	407174	SEASONED/DELICATED	374025	QUICK
345012	MINUTE	345027	SEASONED/FAST FRY	382315	QUICK/ANGUS
365511	MINUTE/FAST FRY	344966	SEASONED/FRYER	345071	RANCH CUT
45305	N/A	343877	SEASONED/GRILLING	344989	ROASTED
340746	NEW ENGLAND STYLE	344973	SEASONED/STUFFED	110130	ROTI
345775	NEW YORK STYLE	139671	SMOKED	352970	ROTISSERIE
344945	NOT APPLICABLE	314401	ST LOUIS STYLE	368092	SAMOSAS
370998	POT ROAST	361544	ST LOUIS/SEASONED	368102	SANDWICH
368093	ROAST	139267	STIR FRY	368106	SAUSAGE PASTA
139653	ROASTER	99965	STUFFED	345028	SEASONED/BREADED
345063	ROASTER GRADE A	310653	STUFFED/BASTED	368116	SHEPHERD PIE
348173	ROASTER UTILITY	469255	STUFFED/CURED	139676	SLOW COOKED
345032	ROASTING	353259	STUFFED/FRYER	368097	STEW
352981	ROLLED	357819	STUFFED/MILK FED	368101	TAQUITOS
345015	SIMMERING			353589	TENDERIZED/BREADED
346193	SIMMERING/FAST FRY			368118	TORNADOS
345041	STEWING			368120	WONTON
351076	SUGARBUSH			368099	WRAPS
139663	TENDERIZED			110376	BLACK FOREST
365510	TENDERIZED/FAST FRY				

434599	TENDERIZED/GRILLING				
344964	TEXAS STYLE				
361952	TRIMMED				
352673	TUSCANY				
110204	UNSPECIFIED				
139661	UTILITY				
354337	UTILITY/MATURE				
346196	VERMONT				
361950	YOUNG/GRADE A				

Source: ACNielsen Homescan™ panel.

Figure 2.1 Meat Classifications in the Study



Source: ACNielsen Homescan™ panel.

2.2.3 Definition of National Brands and Private Labels/Store Brands

A national brand is defined as a branded product sold by a manufacturer through multiple retailers. Some of the national brands for the meat products in the data are: Schneider's, Maple Leaf, Lilydale, High Liner, Olympic, Harvest, Sterling Silver, etc.. On the other hand, many terms have been used to denote the store brand concept in the literature, such as private brands, store brands, home brand, generic brand, private labels, own brands, retailer brands, wholesale brands and distributors' own brands (Liljander et al., 2009). Store brands are generally defined as brands owned by and controlled by retailer stores (Narasimhan and Wilcox, 1998; Sethuraman and Cole, 1999). Some of the private labels/store brands for the meat products existing in the data include: Presidents Choice, No Name (carried by Loblaw store chains), Safeway Select (carried by Safeway store chains), Compliments (carried by Sobeys), Country Morning (carried by Federated Co-operative individual Co-op stores), Western Family (carried by Save-On-Foods), etc..

In the early development, store brand products succeeded in the market due to the lower prices that were nearly twenty percent lower than the similar national brands (Batra and Indrajit, 2000), therefore most retailers and consumers had an impression of private label products as low-priced and low-quality products (Hoch et al., 2002). However, recent difference gaps in quality between the national brand and the store brand products have been decreasing due to manufacturers focusing more on quality and marketing strategies for high end store brand products (Schnettler et al., 2008).

2.2.4 Value Adding Agricultural Policy in Alberta, Canada

Originally released in June 2008, the newly revised implementation plan for the Alberta Livestock and Meat Strategy (ALMS) was completed in August, 2009. Four important groups (including members of the Alberta livestock and meat industry, Alberta Livestock and Meat Agency Ltd., Alberta Agriculture and Rural Development, Agriculture Financial Services Corporation) have been collaborating to develop the new strategies. "Nine priority initiatives are listed in the implementation

plan and the goals are to encourage, facilitate and support the Alberta livestock and meat industry to be internationally respected, competitive and profitable (p.1)." These initiatives include:

- Build Relationships
- Build Trust
- Build Knowledge
- Respond to Consumers and Build Demand
- Build Opportunities
- Build Acceptance
- Build Response
- Build Stability
- Build Capabilities

Source: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/com12203, accessed May, 2010

The Government of Alberta is providing funds of more than $40 million for research and market development projects in supporting seven new programs intended to help Alberta's livestock and meat industry create a profitable and sustainable future. "The objectives are to expand and diversify domestic and import markets, encourage and enable innovation in new product development and enhance production and cost efficiencies. The new programs include the following" (Government of Alberta, 2009):

- Agri-Business and Product Development Program
- Agri-Business Automation and Lean Manufacturing Program
- International Market Development Program
- Value Added Market Development Program
- Research and Development Program
- Industry Development Program
- On-Farm Technology Adaptation Program

The "Agri-Business and Product Development Program" aims to encourage new product development and enhance production and cost efficiencies in Alberta's livestock and meat industry. Program details include: "A total of $2.22 million is available for the 2009/2010 fiscal year. The program will stimulate new investment in value added food and agri-product processing sectors by: targeting agri-food processing companies and producers with innovative; marketing driven opportunities to commercialize a product; creating healthy or healthier products or expand their business." (Government of Alberta, 2009)

2.3 Overview of Value Added Agricultural Product Demand

Understanding recent food-at-home meat purchase patterns is important for meat manufacturers to develop and evaluate product development and marketing strategies and identify target consumer segments that are likely to increase their consumption of particular meat products. Understanding consumer's decision making can also help to maximize meat manufacturers' revenue and minimize their cost. Meat manufacturers can influence consumer purchase decision by product differentiation in various ways:

1. Product differentiation by pricing (Connor and Peterson, 1992; Hinloopen and Martin, 1997; Degeratu et al., 2000; Besanko et al., 2003; Fok et al., 2006; Bontemps et al., 2008; Yuxin et al., 2008; Gonzalez-Benito et al., 2009; Moon and Voss, 2009)
2. Product differentiation by investment on advertising (generic or brand advertising) (Cozzarin and Goddard, 1992; Alston et al., 2000; Verbeke and Ward, 2001; Boetel and Liu, 2003; Srinivasan and Bodapati, 2006; Erdem et al., 2008; Silberstein and Nield, 2008),
3. Product differentiation by distribution channels (through different grocery store chains, different store format, store loyalty) (Beaumont, 1988; Konishi, 2005; Ailawadi et al., 2008; Eacute et al., 2008; Litz and Rajaguru, 2008)

4. Product differentiation by quality/attributes/processing levels (fresh, semi and fully processed, health and convenience) (Huang and Fu, 1993; Kinsey et al., 1993; Yiannaka et al., 2002; Enneking et al., 2007; Anders and Moeser, 2008)
5. Product differentiation by branding (make the market strategy on becoming a national company or coordinating with a grocery chain, brand loyalty), etc. (Connor and Peterson, 1992; Chintagunta, 1993; Hinloopen and Martin, 1997; Chintagunta et al., 2001; Jin et al., 2005; Dolekoglu et al., 2008; Schnettler et al., 2008; Esbjerg and Bech-Larsen, 2009; Gaquez-Abad and Sachez-Perez, 2009; Liljander et al., 2009)

In this section, first of all, traditional consumer theory, which is the basis of the analysis in this study, is reviewed. Then concepts such as: 1. how consumers make their purchase decision process, 2. consumers' preferences between national brands and private labels, 3. demand for value added meat products, 4. effects of own and cross price elasticities of demand for different meat products will be explored in the following literature review. In the end of the chapter, there will be a summary of Canadian meat demand studies.

2.3.1 Consumer Theory

Consumer theory is the theory that links consumer preferences (through indifference curves and budget constraints) to consumer demand curves. Neoclassical economics assumes that individuals are rational in decision making. Consumer behaviour analysis is based on a utility function that determines the consumer's well-being level. Neoclassical consumer theory is based on the assumption that an ordinal utility function can describe a consumer's preferences. Necessary assumptions include completeness, transitivity, continuity, non satiation and convexity (Deaton and Muelbauer, 1980). An acceptable utility function generally should satisfy three conditions: it must be complete, it must depict consistent behaviour, and it must satisfy a transitivity condition. Models of consumer behaviour are based on the assumption that consumers make utility maximizing behaviour under economic

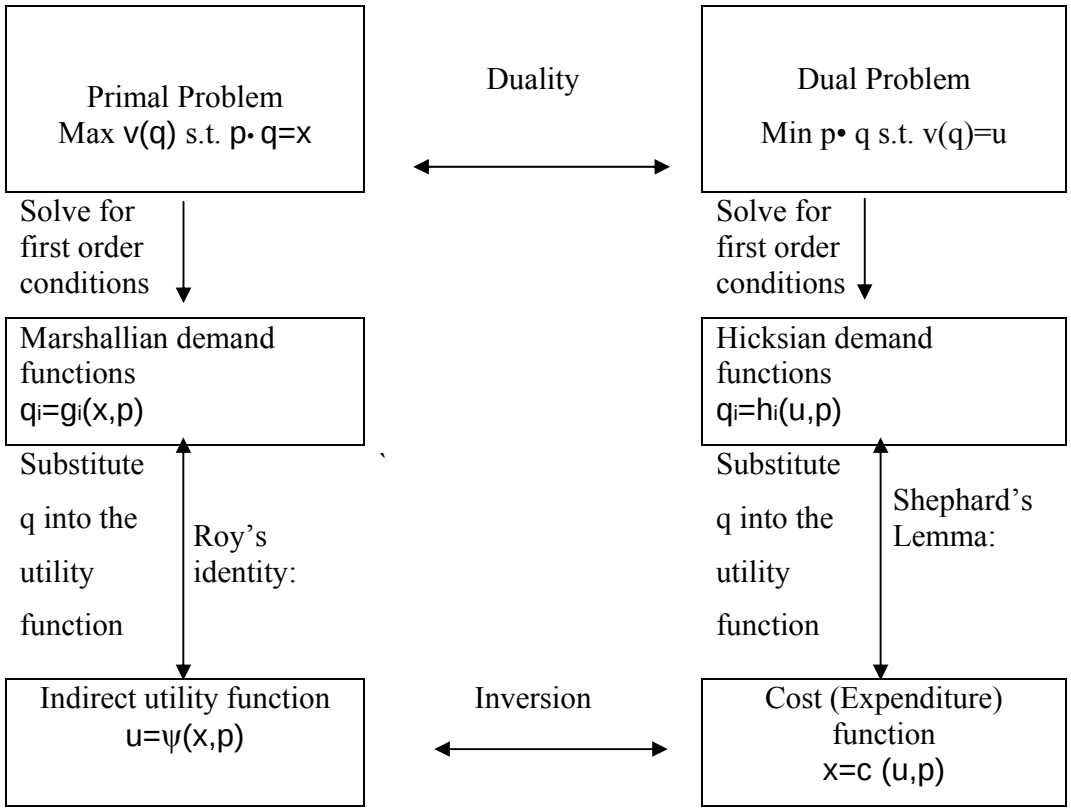
constraints. The utility maximization problem is called the primal problem, and it is denoted as (Deaton and Muelbauer, 1980, p.37):

$$\max u = v(x)$$
$$s.t. px \le m \quad ,$$

where (p, x) is the total cost of consuming x of the products at price level p, (u) is the consumer's utility function. Dual to the utility maximization problem is the cost minimization problem

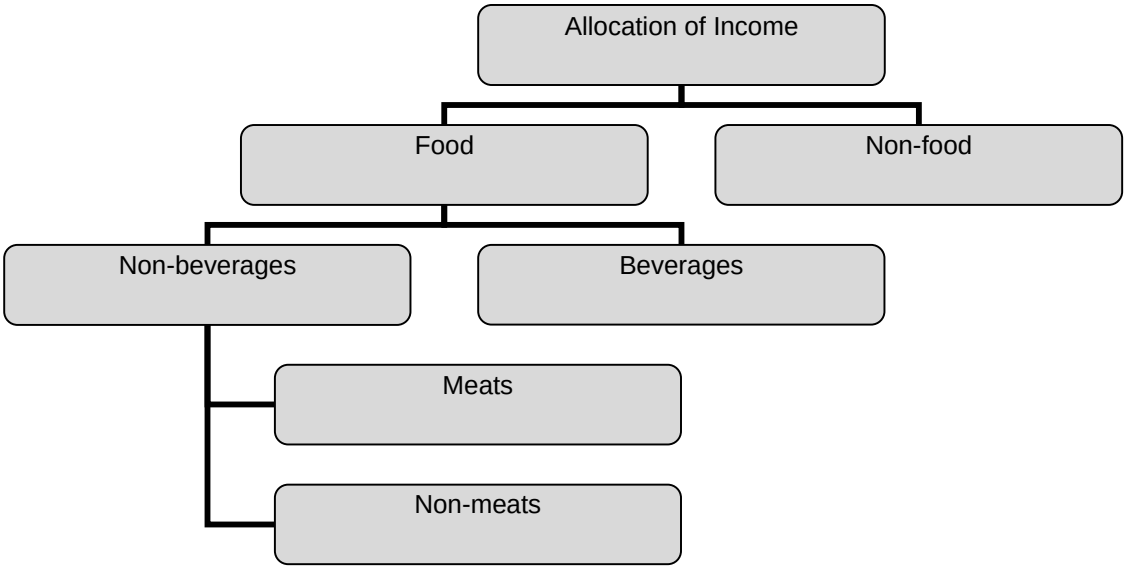
$$\min m = px$$
$$s.t. v(x) = u$$

The relationships between the utility maximization and cost minimization problems are briefly summarized below (based on Deaton and Muelbauer, 1980):



Source: *Economics and consumer behaviour*, Deaton and Muelbauer, 1980, page 41.

Various authors have used the concept of separability in empirical demand analysis (Leontief, 1947; Deaton and Muelbauer, 1980; Sellen and Goddard, 1997; Lambert et al., 2006; Dong et al., 2007; Anders and Moeser, 2008). In demand analysis, weak separability was originally identified by Leontief (1947). Deaton and Meulbauer (1980) suggested that a group of consumption goods can be separated from the rest of the consumption goods, so that the consumer preferences within a group can be described independently of other groups. It indicates that consumers may first allocate their total expenditures to a wide variety of aggregate goods and then allocate expenditures among sub-groups, according to their prices and sub-group expenditures. Thus weak separability can be seen as a multi-stage budgeting process which can reduce the number of variables and parameters to a manageable size (Eales and Unnevehr, 1988; Sellen and Goddard, 1997). A possible utility tree for consumer goods could be illustrated as follows, more possible utility trees for this study will be further discussed in the next section.



2.3.2 Hierarchy of Consumer Purchase Decision Making

Many food demand studies conclude that consumer purchase decision making follows a hierarchical process (Brucks, 1988; Wrigley, 1988; Chiang, 1991; Krishnamurthi et al., 1992; Besanko et al., 1998; Guadagni and Little, 1998; Degeratu et al., 2000; Montgomery, 2002; Sood et al., 2004; Chernev, 2006; Juhl et al., 2006; Ailawadi et al., 2008; Esbjerg and Bech-Larsen, 2009; Gaquez-Abad and Sachez-Perez, 2009; Hui et al., 2009). The focus of this study is on how meat consumers make their decision to purchase meat products: do they select store, then fresh versus semi-processed versus fully processed? Do they choose meat type (beef, pork, for example) at first, second or third stage of their decision structure (e.g. before store, before type, before brands).

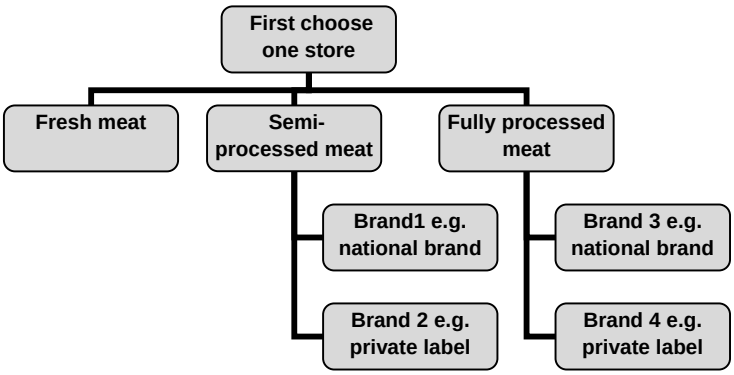
Wrigley (1988) suggests that the importance of the sequence of shopping decisions is if "consumers choose a store knowing that they can obtain a desired brand there, then branding, promotion and advertising support are that much more important" (p.293). Brucks (1988) suggests a sequence of choices as first, choosing stores and then making the brand choices. Kahn and Schmittlein (1989) consider the hierarchical purchase process as that consumers would first choose the store to shop at and then choose brands.

Chiang (1991) views the decision process as "whether to buy," "what to buy" and "how much to buy". Krishnamurthi and Raj (1992) view brand choice and purchase quantity as related decisions. Chintagunta (1993) concludes that household purchase behaviour contains three components: purchase incidence, brand choice and purchase quantity. Kamakura et al. (1996) conclude that "some consumers choose brand first before they choose product form, size, or flavour. Other consumers may first select the flavour, and then make the decisions among the brands offering the selected flavour" (p.153). Guadagni and Little (1998) conclude that a decision tree for a customer on a shopping trip is that "the customer may be viewed as deciding sequentially when to buy and then what to buy but with interactions between the decisions" (p.4).

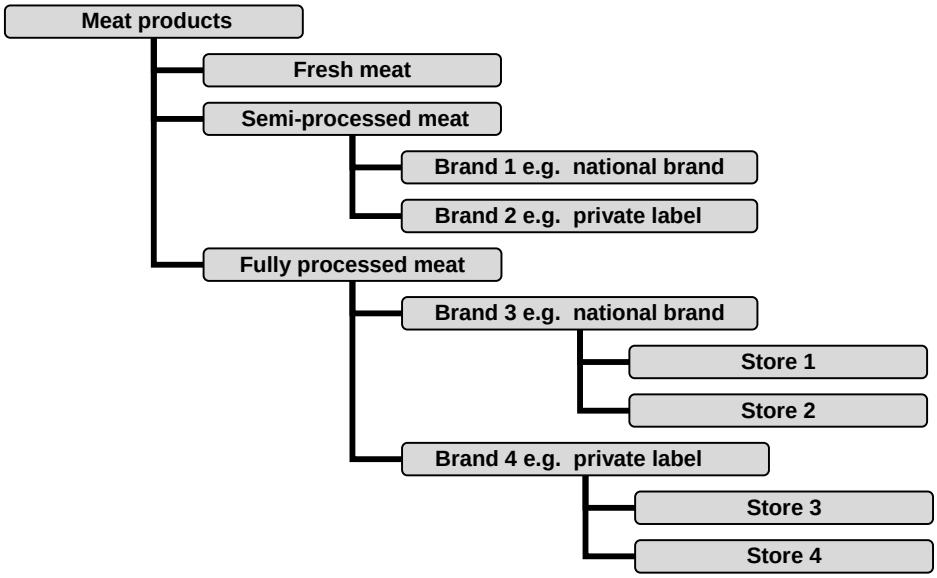
Degeratu et al. (2000) divide the choice decision into a two-stage choice model in which customers first choose the store type and then choose brands. Hui et al (2009) divide a shopping path decision making process into three stages of visit, shop, and buy decisions. Ailawadi et al. (2008) indicate private labels have an influence on consumers' expenditure shares at different grocery stores. Gaquez-Abad and Sachez-Perez (2009) view the purchase of olive oil as a hierarchical process: "consumers first decide what type of oil (e.g., soya, olive, sunflower, etc.) they need. Then the consumers make the brand choice decisions" (p.37). Some other studies (Juhl et al., 2006; Esbjerg and Bech-Larsen, 2009) show that consumers first choose stores, and then choose brands as well.

Based on the previous hierarchy of choice studies, it can be assumed that when consumers allocate budget shares within the meat subgroups, weak separability of consumer preferences can lead further to the assumption that consumers engage in certain hierarchical budgeting processes for the shopping decision (Montgomery, 2002). The possible decision flow for the meat purchase decisions in the study is among choices of: stores choices, meat choices by types (fresh, semi and fully processed meat), and meat choices by brands (national brands vs. private labels). The following three examples of decision flows are among many possible combinations, consumers could also make other decision processes.

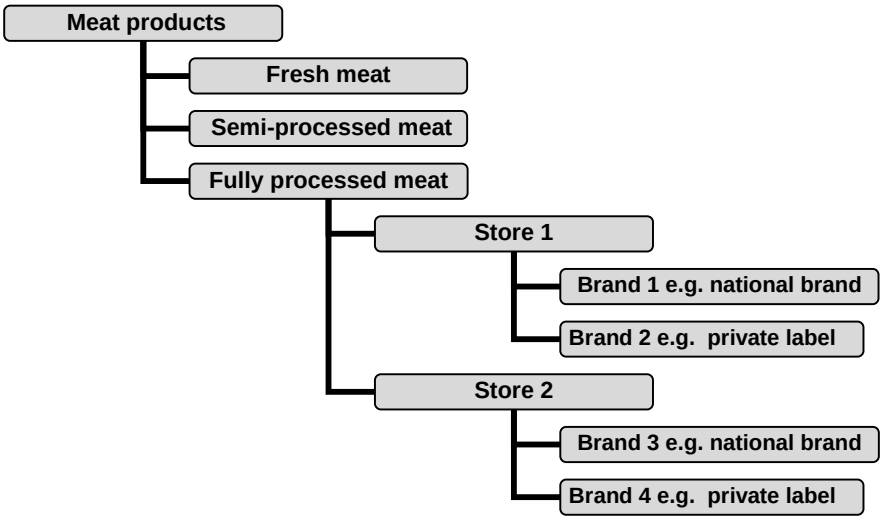
Assumption 1: one possible decision making process could be: consumers first choose where to shop, and then make the decision of what type of meat to purchase, and finally choose among different brands.



Assumption 2: an alternative process could be: consumers first make the decision of what type of meat they need to purchase, then they choose related brands, finally they decide where to buy the certain meat products.



Assumption 3: consumers could first make the decision of what types of meat they need to purchase, then they choose where to shop, finally they make the brand decision for the certain meat products.



In this study the hierarchy of decision making is not tested, the focus is on the links between store choices, meat choices by types (fresh, semi and fully processed meat), and meat choices by brands (national brands vs. private labels). Each stage is estimated separately and the structure of decision making should be tested in later studies.

2.3.3 Factors Affecting Consumers' Decision Making Process

Product differentiation can affect consumers' decision making process in various ways: product differentiation by pricing, by branding (national brands v.s. private labels), by distribution channels (store choice and store loyalty), by investment in advertising (generic v.s. brand advertising) will all have different effects. A literature review of the factors that affect consumers' decision making process is provided in the following section.

Product Differentiation by Pricing

Price plays an important role in consumers' decision making processes. Consumers make a purchase decision among available alternative products with different prices and qualities. Many studies find that price is important as a signal of brand quality (Conrad, 2005; Erdem et al., 2008). Caves and Greene (1993) find that price has a positive role in enhancing perceptions of the quality of convenience products. Wathieu and Bertini (2007) conclude that a price higher than consumers' expectations may increase the product's perceived quality. Anders and Moeser (2008) find that demand for organic beef is highly dependent on price and expenditures, consumers are highly price responsive to price changes of organic products. In addition, price can be regarded as a reference point for comparative judgments (Raghubir, 2006). Reference pricing can be formed through prices of other products or at other stores (Alba et al., 1994; Inseong and Pradeep, 2006), from past prices of the same products and from price expectations from prior promotion experiences (Mayhew and Winer, 1992; DelVecchio et al., 2007). Laroche and Toffoli (1999) conclude that price can influence consumers' purchase of brand products. Dunne and Narasimhan (1999)

note that consumers' perception of price and quality is an important factor for choosing brands. Bontemps et al. (2008) observe a positive relation between brand price and purchases of private labels. Moon and Voss (2009) find that price sensitive consumers have the lowest brand loyalty.

Price can also be used as a discounting strategy to influence store traffic and the sales of particular items (Chandon et al., 2000; Levy et al., 2004; Ellickson and Misra, 2006; Gauri et al., 2008). The overall price level of a store can affect consumers' purchase decisions (Hamilton, 2008). Funk et al. (1977) found that it was effective for chains to lower average price across meats to increase total revenue. Some retailers use promotional or "high-low strategy" (HILO) to frequently charge relatively high prices but sometimes offer temporary deep discounts on some products, others use everyday low price (EDLP) strategy to consistently offer low average prices without further discounting (Erdem et al., 2008). However price discounts may also have downside effects on product promotion or even lower consumers' perceptions of product quality (Alba et al., 1999; DelVecchio et al., 2007). For example, when there is a deep discount on certain products, consumers might lower expectations of the products' future price or cause false impressions of the quality of the product. After prices return to normal levels, consumers may stop purchasing and wait for future promotions (Sun et al., 2003).

Product Differentiation by Branding (National Brands v.s. Private Labels)

Over the past two decades store brands or private labels have been increasingly gaining in retail market share across different food categories (Steiner, 2004). More and more private labelled products have emerged in the retail market, and become an importance part of market share. A specific branded product can be used as an effective way to meet the requirements of target consumers. The phenomenon can be seen in many major retailing markets in the world. Sethuraman (2003) indicates that private label sales "account for about one-fifth of total volume sales in the United States, one-fourth in Canada, and nearly one-half in Europe" (p.1).

Selling a mixture of product brands has been used as a marketing strategy in promoting products by different retailers. Some grocery stores provide a wide product assortment of both national and store brands. Many retailers have grown their store shares for store brands and offer large sections of store brand product categories. On the other hand, other grocery stores mainly focus on offering national brand products and have only a few store brand products. Pellegrini (2005) finds that larger retailers tend to develop their own store brands to differentiate themselves from smaller local retailers/convenience stores that offer national brand products. Therefore, many food manufacturers and processors face choices of whether or not to make store brand products under contract to retailers (Juhl et al., 2006). A manufacturer thus faces two alternative choices: either to sell products under its own brand, namely national brands; or to cooperate with retailers and produce store brand products (Pellegrini, 2005). As a consequence, it is important to understand how consumers make their brand choices over time.

Three main research areas have been explored regarding private labels/store brands in the literature: market factors and marketing strategy affecting development of private labels; consumers' perceptions of private label products; the relationship between consumer socio-demographic characteristics and their preferences for store brands (Schnettler et al., 2008). This study will mainly focus on household demographic variables and their effects on preferences for national brands and private label products. The difference between national brand and store brand, consumers in terms of household demographic, socio-economic variables will be the focus.

Product Differentiation by Quality/Attributes, by Amount of Value Adding (Fresh, Semi- and Fully Processed, Health and Convenience)

Some broad fundamental socio-economic changes have been taking place over the past decades (Geeroms et al., 2008): for example more female labour force participation (FLFP) (Iversen and Rosenbluth, 2008), increasing job/time pressure and fewer meals prepared or eaten at home (Devine et al., 2006), an increase in single-person households (Jiang and O'Neill, 2007), etc.. The demand for self pre-prepared, easy-to-prepare, healthy and refrigerated/ frozen value added food is likely

to increase as North American households are turning to more convenient and health oriented meal solutions (Kinsey et al., 1993; Richards et al., 1998; Fairbairn and Gustafson, 2004; Ragaert et al., 2004; McMillin and Brock, 2005; Verbeke, 2005; Gardiner, 2006; Harris and Shiptsova, 2007; Anders and Moeser, 2008; Herath et al., 2008). New products with convenience and health attributes are being continuously introduced in the North American marketplace (Knudson and Peterson, 2005).

Coltrain et al. (2000) note that increased consumer demand for health and convenience, along with technological development has led to an increase in product differentiation and added value to raw commodities. Lomeli et al. (2004) show that media coverage related to food safety and health concerns can influence consumers' meat demand. Rr et al. (2005) find that consumer perceptions of food quality have been increasing from 1994 to 2002. Ellis (2007) finds that consumers have concerns about trans fats in food products and select foods low in trans fat according to food labels. Geeroms et al. (2008) indicate that consumers' health-related concerns have an impact on demand for ready meal consumption, and socio-demographic characteristics such as gender, household age, or education level, are highly affecting consumers' perceptions of health.

Regarding the addition of value to food products, many studies note the increasing number of value added products in the market due to technology development and consumers' increasing demand for value added products (Richards et al., 1998; Coltrain et al., 2000; Cowan, 2002; Fairbairn and Gustafson, 2004; McMillin and Brock, 2005; Anders and Moeser, 2008; McEachern and Warnaby, 2008). Value added food processing has become an important marketing strategy in the competitive food industry (Fairbairn and Gustafson, 2004). High value added food products usually can offer improved product quality and increased convenience for consumers (Cowan, 2002).

However not all products have the same value adding levels, take meat as an example, the level of value adding varies across meat types. Ward (1997) notes that a rising number of meat products are value added and differentiated from the traditional fresh forms. Although many pork products are sold in value added forms in the

market, e.g., bacon, hams, and sausages, a high percentage of pork products have still been sold in fresh forms over time. There are fewer value added beef products in the market and a large percentage of beef products are sold in fresh form. The summary table of value added levels in beef, pork and chicken is shown as below (Ward, 1997). Lawrence et al.(2001) find the same trend for value adding levels. Through surveys of the largest beef and pork packers, they find that "pork has more value added products than beef, with most bacon, sausage, and ham products being differentiated and branded products. Twice the percentage of pork (38 percent) is sold for further processing as compared to beef (19 percent)" (p.382). Same trend can also be found in the data disaggregation in this study.

Table 2.3 Value adding levels: Beef, Pork, and Poultry

Category	***Beef***	***Pork***	***Poultry***
Value Added Products at Retail	Low	Moderate	High
New Product Development	Slow	Moderately aggressive	Very aggressive
Brand Marketing	Low	Moderate	High

Source:(Ward, 1997).

Product Differentiation by Distribution Channels (Store Choice and Store Loyalty)

The competitive landscape in retailing has changed over the past 40 years in Canada. The number of grocery stores has been declining whereas the size of the existing stores has been increasing, partly due to new entry by so-called supercenters e.g. Wal-Mart and Costco (Agriculture and Agri-Food Canada, 2009). Many studies have focused on consumers' store choice behaviour. Fotheringham (1988) argues that the decision making process for store choice can be regarded as a hierarchical process, consumers would go through a sequential decision making process. Leszczyc et al.

(2000) conclude that consumers follow three dynamic stages in their decision making process: when to shop, where to shop, and how much to spend. After determining a need for shopping, the consumer then makes the store choice decision.

Other studies focus on the relationships between store brands and store loyalty (Ailawadi et al., 1999; Degeratu et al., 2000; Ailawadi and Keller, 2004; Martenson, 2007; Rita, 2007; Ailawadi et al., 2008; Liljander et al., 2009). Batra and Indrajit (2000) report that store brands can be used as a unique advantage and generate bargaining power with product manufacturers to increase store profitability. Hansen and Singh (2008) indicate that private labels can be an important marketing strategy for retailers to build store loyalty and target specific consumers. Ailawadi et al. (2008) find there is a strong relationship between a household's store brand expenditure share at a grocery store and its store loyalty. In addition, store loyalty can influence store brand share as well. They show that share of wallet, share of store brand products purchased, and share of shopping can affect consumers' store loyalty behaviour in their study.

The store chains' own characteristics (e.g. service, location, distance) and consumers' socio-demographic variables (e.g. income, household size, education) are the focus in other studies as well (Aaker and Jones, 1971; Wrigley, 1988; Alba et al., 1999; Leszczyc et al., 2000; Baltas and Papastathopoulou, 2003; Sinha and Banerjee, 2004; Tripathi and Sinha, 2006; Hui et al., 2009). Crask and Reynolds (1978) find that household age, education and income level have an influence on the shopping frequency at department stores. Sackmary (1987) shows that household characteristics play an important role in direct marketing. Hutcheson and Mutinho (1998) indicated that the price level of the store, the frequency of promotions and product quality have an effect on store choices. Sampson and Tiger (1994) find that warehouse club (like Costco, Sam's Club) members tend to be better educated with higher income.

Leszczyc et al. (2000) show that household demographic variables have a close relationship with store choices. Hu (2006) finds that household size, presence of children and household incomes are the individual level parameters that affect store

choices and service selection. Carpenter and Moore (2006) indicated that household education, income and household size have a close relationship with retail format choices. Gauri et al. (2008) conclude that household socio-demographic variables have influences on both store price and store format type strategies.

In summary, store own characteristics (e.g. advertising expenditure) and household socio-demographic variables (e.g. income, household size, education) play an important role in the case of meat purchases which will be the focus of this study.

Product Differentiation by Investment on Advertising (Generic v.s. Brand advertising)

Advertising has been popular among producer groups seeking to differentiate and increase sales of agricultural products such as beef, pork, and chicken. The meat industry has also spent a great deal on advertising (Brester and Schroeder, 1995). In various empirical studies, there are two main types of advertising identified: generic and brand advertising. Generic advertising promotes consumption at the commodity level of products (e.g. beef, pork, chicken, etc.). Brand advertising, on the other hand, aims to promote the characteristics of a specific brand of the product (e.g. Maple Leaf and Lilydale products etc.).

Brand and generic advertising play slightly different roles in consumer purchases. Brand advertising aims to create consumers' repeat purchases of a particular brand. Generic advertising aims to promote a certain product group to the consumers regardless of the brand names it is sold under. Generic advertising can be used to reduce the impact of negative information about meat products. Many demand studies analyze the effect of advertisements on the consumption of meat products using different approaches. In some studies advertising enters the model as a demand shifter (Cozzarin and Goddard, 1992; Brester and Schroeder, 1995; Piggott et al., 1996; Kinnucan et al., 1997; Verbeke and Ward, 2001; Lerohl et al., 2004; Dong et al., 2007), others use advertising as a translating parameter (Alston et al., 2000; Boetel and Liu, 2003; Lerohl et al., 2004)

Cozzarin and Goddard (1992) found that estimated results of advertising effects were sensitive to functional form. Brester and Schroeder (1995) concluded that generic advertising for pork and beef had no significant effects on meat demand, while brand advertising had a significant impact. Piggott et al (1996) investigated the Australian market and concluded that generic advertising of beef had a positive own effect on chicken; however, generic advertising of pork had no significant impacts on meat demand. Cranfield and Goddard (1999) concluded in their Canadian meat demand study that Canadian producers gained a net profit from their advertising investment and both generic and brand advertising can increase beef demand.

Alston et al. (2000) included advertising variables and tested their statistical significance, they concluded the effects of advertising were complex and small for demand. Verbeke and Ward (2001) included both generic and brand advertising in their meat demand analysis, they found that own advertising effects varied across meat species. Yiannaka et al. (2002) examined the advertising effects on firms' sales for processed meat using an unbalanced panel data set of 34 firms during the period 1983-1997. The results indicate that total advertising has a very important influence on the sales. Dong et al. (2007) also indicated that effects of generic advertising varied across meat and fish products.

In addition, store advertising expenditure can also play an important role to promote meat sales in store. Funk et al. (1977) found that a store's own advertising had a positive effect on meat sales. Capps and Lambregts (1991) used store scanner data and indicated that store advertising was worthwhile in increasing the sales of seafood, but it was still subject to the cost of the advertising expenditure. Gijsbrechts et al. (2003) focused on the performance of retailers' store flyers as one of the store advertising methods, the authors included that store advertising can affect store traffic and sales.

2.4 Demand Analysis Summary

Based on previous studies, econometric meat demand analyses have made use of a number of modelling approaches from single equations to demand systems with different functional forms using annual, quarterly and monthly data. In this section the previous economic meat demand analyses are described including how consumer meat demand decisions can be modelled according to data availability.

2.4.1 Data Sources

Previous Canadian consumer meat demand studies have used either a) Statistics Canada Household Food Expenditure Survey data (Lambert et al., 2006), or b) aggregate time series disappearance household/individual product purchase data (Eales, 1996; Lerohl et al., 2004). Unfortunately, Statistics Canada only periodically collects the household expenditure survey information and the participating households vary in each survey. Therefore, with the use of the expenditure survey data, the evolution of changing household demographics and their impact on Canadian meat demand is unclear and it is impossible to identify regional difference. Thus the two nationally representative datasets of household's meat/food purchases in restaurants (NPD CREST™ data) and grocery stores (ACNielsen Homescan™ data) were acquired to be used in the study to overcome the aforementioned shortcomings.

Time Series vs. Cross Sectional vs. Panel Analysis

Time series analyses can identify consumption patterns over time for a specific commodity. A time series is a series of successive observations over time. Cross sectional studies are used to assess differences across individuals at a given period. Time series analyses can provide a better understanding of the consumers' demand trend over time, but the limitation is that it is only for one spatial location or one individual. Cross sectional analysis usually focuses on the relationship between different individuals at a given period. Panel data set combines observations both

cross sectionally and over time, the advantage of panel analysis is that it increases sample size over either cross-section or time-series data.

Due to the fact that few sources of cross sectional or panel data were available in the past meat demand research, most meat demand studies in North America have focused on time series analysis rather than cross-sectional or panel household level micro data (Yeh, 1961; Kulshreshtha and Wilson, 1972; Tryfos and Tryphonopoulos, 1973; Hassan and L. Katz, 1975; Hassan and Johnson, 1979; Young, 1987; Alston and Chalfant, 1991; Chalfant et al., 1991; Cozzarin and Goddard, 1992; Xu and Veeman, 1996). Only recently have meat demand studies increasingly used cross sectional or panel data to model factors that affect meat purchasing (Chintagunta et al., 2001; Baltas and Papastathopoulou, 2003; Lomeli, 2005; Ward and Ferrara, 2005; Lambert et al., 2006; Anders and Moeser, 2008; Maynard et al., 2008).

Panel data analysis can improve the efficiency and variability of econometric estimates, because panel data sets are collected across individuals/households and time (Baltagi, 2008). Hsiao (2003) also demonstrates several benefits from using panel data, including controlling for individual heterogeneity while a time series study or a cross section study cannot (Hsiao, 2003). Panel data sets are usually two-dimensional, ie (Baltagi, 2008, p.13):

$$y_{it} = \alpha + X_{it}^{'}\beta + \mu_{it} \quad \text{i} = 1,\ldots, \text{N}; \quad \text{t} = 1,\ldots, \text{T}$$

where *i* denotes households or individuals (cross section dimension) and t denotes time points (time series dimension), and α is a scalar, while $X_{it}^{'}$ is the it th observation on a vector of *k* nonstochastic regressors.

Different assumptions can be made on the precise structure of models using panel data. The two most common models are one-way fixed effects regressions and random effects regressions (Baltagi, 2008).

The fixed effects model is denoted as (Baltagi, 2008, p.14):

$$y_{it} = \alpha + \beta' X_{it} + u_{it}, \text{ i} = 1,\ldots, \text{N}; \quad \text{t} = 1,\ldots, \text{T}$$

$$u_{it} = \mu_i + \nu_{it},$$

where μ_i, the unobservable individual-specific effect, are assumed to be fixed parameters; the ν_{it}, the remainder disturbances, follow a independent and identically distributed IID (0, σ^2 υ). The fixed-effects model assumes Xit are independent of vit for all i and t, indicating the individual-specific effects are correlated with the independent variables (Baltagi, 2008).

The random effects model assumes in addition that (Baltagi, 2008, p.15):

μ~IID (0, σ^2 μ)

and

υ~IID (0, σ^2 υ).

The two error components μ and υ are independent of each other, so the random model assumes X_{it} are independent of ν_{it} and μ_i, for all i and t, indicating the individual-specific effects are uncorrelated with the independent variables (Baltagi, 2008).

The general structure of a panel data is based on a matrix of N units and T periods. When the number of time observations is the same for each individual observation unit (N units and T periods), the panel is a balanced panel, in which case the matrix is completely filled. A more realistic alternative is when some observations are missing, the number of household observations per each period varies, and the panel is then an unbalanced panel (Baltagi, 2008). To conduct manageable analyses and comparisons, ACNielsen Homescan™ balanced panel over the period 2002 to 2007 with the fixed effect models will be used in the estimation of the study.

2.4.2 Demand Systems vs. Single Equations

Using demand systems for analysis has many advantages over single equation methods (Alston, Chalfant and Piggott, 2000). Studies about food demand systems

are a common research topic. In the past literature, different functional forms can be summarized into two main modelling approaches (Clements and Theil, 1987).

One of the approaches is to specify an indirect utility function/a cost function, including classical demand systems, budget share demand systems from translog indirect utility functions, Working-Leser demand system and almost ideal demand systems (AIDS). The other approaches apply demand system equations without requiring utility or cost functions specification. Examples of demand systems in this field include the Rotterdam model.

2.4.3 Elasticity Measurement

Economists focusing on consumer behaviour usually use changes in income and price as explanatory variables. Traditional demand studies view quantity as the dependent variable, and price and household income as the independent variables. Marshallian, ordinary, or uncompensated demand functions contain both the income and price effects, whereas Hicksian or compensated demand function contains only price effects (Johnson et al., 1984).

Elasticities are useful measures to describe the relationship between two variables in demand analysis. Price elasticities are often used to describe the change in quantity as a result of a change in the price of specific goods. In this study three different elasticities will be measured, own price, cross-price and expenditure elasticities.

Firstly, own price elasticity measures the percentage change in the quantity demanded "caused" by a one percentage change in own price of the product. Based on economic theory, demand functions for normal goods show an inverse relationship between price of the good and quantity, thus the own price elasticities for meat products are all expected to be negative.

Secondly, cross-price elasticities show the responsiveness of consumers of a good to changes in the prices of related goods. Positive cross-price elasticities indicate substitute products, while a negative cross price elasticity represents complementary products.

Last but not least, the expenditure elasticity measures how a change in a buyer's expenditure shifts the demand function for a good or service. Some demand models, such as the almost ideal demand system (AIDS), use budget shares or expenditure on goods in estimating the demand system (Deaton and Muelbauer, 1980). On the basis of the magnitude of expenditure/income elasticities, all products can be grouped into three groups. If the expenditure elasticity is positive and more than one, the good is defined as a luxury product. A positive expenditure elasticity ranging between 0 and 1 indicates a normal product, whereas a negative expenditure elasticity is defined as an inferior product.

2.5 Summary of Canadian Meat Demand Studies

This section provides a brief summary of previous meat demand studies for Canada (Table 2.4). A number of studies have been conducted in Canada since the early 1970's. The first Canadian meat demand study found in the literature was published in 1961 (Yeh, 1961), and the author used annual data for the period 1929 to 1958 to investigate how consumers react to changes in the prices of beef and pork and disposable income. Kulshreshtha and Wilson (1972) focused only on beef demand in their study. Tryfos and Tryphonopoulos (1973) used annual data for the period 1954 to 1970 on beef, pork, chicken, lamb, veal and turkey demand. Hassan and Katz (1975) applied Seemingly Unrelated Regression (SUR) analysis to estimate price and income elasticities of demand for beef, pork, lamb, veal, chicken and turkey. Hassan and Johnson (1979) applied Box-Cox transformation of variables analysis using a variety of functional forms (Linear, Double log, semi-log, log-inverse and general), and proved that different specifications can lead to different elasticity results. Hassan and Johnson (1983) applied different estimation procedures (OLS, GLS and SUR) with seasonality hypotheses to demand for beef, pork, veal, chicken and turkey. Young (1987) and Atkins et al. (1989) attempted to analyze structural change in Canadian meat demand. Young (1987) used a single-equation approach and found evidence of structural change in Canadian demand for pork, chicken and turkey, but no such evidence for beef.

Many Canadian meat demand studies have emerged using the AIDS models since 1991. Alston and Chalfant (1991) compared different functional forms and concluded that an incorrect use of functional form can lead to a finding of structural change in meat demand. The authors concluded that better data or better methods were needed for demand studies. Chalfant, Grey and White (1991) analyzed AIDS demand systems for beef, pork, poultry, and fish. They found a small positive cross price elasticity between fish and pork. Chen and Veeman (1991) used a dynamic AIDS model for Canadian meat demand and compared it to a static AIDS model. The authors examined structural change in meat demand by testing for non-constancy of the parameters of the non-linear system. The reason for the structural change could be increasing health concerns regarding diets and growth of fast food outlets. Reynolds and Goddard (1991) also focused on structural change and analyzed demand for beef, pork and chicken. Their results showed that the structure of Canadian meat demand was changing gradually over 1975 to 1984. The elasticities were significantly different before and after the structural change. The results indicated that structural change was biased away from beef consumption and to chicken consumption.

Cozzarin and Goddard (1992) first included advertising as a factor in meat demand. They compared two types of models between Translog and AIDS to analyse the meat products: beef, pork and chicken. Moschini and Vissa (1993) applied a mixed demand approach to analyze Canadian meat demand. They found that the estimated own price elasticity of chicken demand is greater in the mixed demand system; others are the same as those in a direct Rotterdam model. Eales (1996) used both the static and dynamic AIDS and IAIDS to test for endogenous RHS variables. All the AIDS estimates were in agreement as to the responsiveness of demands. The results indicated that IAIDS models were more "elastic" than AIDS models. Xu and Veeman (1996) applied joint non-nested testing for both the linearised almost ideal and Rotterdam models. The test results for structural change showed that the gradual transition almost ideal model is preferred over the gradual-transition Rotterdam model for Canadian meat purchasing.

Lerohl et al. (2004) and Lomeli (2005) included media influences on changes in consumption of meat products in Canada using both time series and cross sectional data. Results found that pork-safety issues have negative and significant own consumption effects and positive cross-effects on beef. Pork generic advertising has own positive effects, while pork consumption is negatively affected by chicken generic advertising. Both beef brand and beef fast food restaurant advertising increase beef consumption. Lambert et al. (2006) aimed to analyse regional differences in meat and fish demand across Canada. A QUAIDS demand system is applied in the study using Canadian household food expenditure surveys conducted in 1992 and 1996. The authors find that various variables including prices, age, ethnicity and real total meat and fish expenditure affect the probabilities of purchase. Anders and Moeser (2008) used weekly retail and household scanner data to estimate consumer demand for organic and conventional fresh beef products in the Canadian retail market. The results indicate that "organic beef is highly dependent on price and expenditures, whereas demand for conventional beef is mostly driven by income, habits and 'typical' Canadian seasonal beef consumption patterns" (p.457).

Table 2.4 The summary of Canadian meat demand studies

Authors	Meat types	Functional forms	Data	Results
Yeh, 1961	beef and pork	Double logarithmic	Time series data for the period 1929 to 1958	Estimates were consistent with those obtained in previous studies
Kulshreshtha and Wilson, 1972	beef	Linear	Time series data for the period 1949- 1969	Estimates were consistent with those obtained in previous studies
Tryfos and Tryphonopoulos, 1973	beef, pork, chicken, lamb, veal and turkey	Linear	Time series data for the period 1954 to 1970	Estimates were consistent with those obtained in previous studies
Hassan and L. Katz, 1975	beef, pork, lamb, veal, chicken and turkey	Linear	Time series data for the period 1954 to 1972	In addition, most of the elasticities are in keeping with comparable results obtained from other studies
Hassan and Johnson, 1979	beef, pork, veal, chicken and turkey	Linear, Double log, semi-log, log-inverse and general	Time series data for the period 1965 to 1976	Different specifications can lead to different elasticity results.
Hassan and Johnson, 1983	beef, pork, veal, chicken and turkey	Linear	Time series data for the period 1965 to 1977	For the existence of fixed quarterly or seasonal effects, dummy variables with fixed coefficients should be used in the analysis.
Young, 1987	beef, pork, chicken, turkey	Linear, Double log, linear-log and Box-Cox	Time series data for the period 1968 to 1986	Found that the income elasticities were very sensitive to the model specifications and some specifications produced negative elasticities
Atkins, Kerr and McGivern, 1989	beef, pork and chicken	Linear	Time series data for the period	Found a structural break in beef demand.

Authors	Meat types	Functional forms	Data	Results
			1968 to 1986	
Alston and Chalfant, 1991	beef, pork, poultry and fish	Linear, Double log, LA/AIDS, Rotterdam	time series observations from 1960 to 1988	Incorrect use of functional form can lead to a finding of structural change in meat demand
Chalfant, Grey and White, 1991	beef, pork, poultry, and fish	LA/AIDS	time series observations from 1960 to 1988	Small positive elasticity between fish and pork, consumption is positive for chicken and fish, but negative for beef and pork
Chen and Veeman, 1991	beef, pork, chicken and turkey	LA/AIDS	Quarterly time-series data from 1967 to 1987	Structural change in the meat demand, could be caused by increasing health concerns regarding diets and growth of fast food outlets
Reynolds and Goddard, 1991	beef, pork and chicken	LA/AIDS	Quarterly time-series data from 1968 to 1987	The results indicated that structural change was biased away from beef consumption and to chicken consumption.
Cozzarin and Goddard, 1992	beef, pork and chicken	Translog and AIDS	time-series data	First included advertising factor in meat demand
Moschini and Vissa, 1993	beef, pork, and chicken	Rotterdam model	time series observations from 1980 to 1990	Own price elasticity of chicken demand is greater in the mixed demand system, others are the same as those in a direct Rotterdam model.
Eales, 1996	beef, pork, and chicken	AIDS and IAIDS	Quarterly time-series data from 1970 to 1992	The results indicated that IAIDS models were more "elastic" than AIDS models.

Authors	Meat types	Functional forms	Data	Results
Xu and Veeman, 1996	beef, pork and chicken	AIDS and Rotterdam	quarterly retail-level data from 1967 to 1992	The test results of structural change shows that the gradual transition almost ideal model is preferred over the gradual-transition Rotterdam model for Canadian meat consumption.
Salvanes and DeVoretz, 1997	beef, pork and chicken, fish(fresh/processed)	LA/AIDS	Statistics Canada 1986 Food Expenditure Survey Public Use Microdata Files	Canadian fish demand cannot be modeled separately away from meat.
Lerohl et al., 2004; Lomeli, 2005	beef, pork, and chicken	Generalized Box-Cox	Canadian meat market data from 1976 to 2001	Pork generic advertising has own positive effects
Lambert et al., 2006	fish, beef, pork, chicken, and other meats	QUAIDS	Canada's Food Expenditure Survey for 1992 and 1996	The authors find that various variables including prices, age, ethnicity and real total meat and fish expenditure, on the probabilities of purchase
Maynard et al., 2008	beef entrees	Double-hurdle model	Canadian FAFH purchasesfrom 2000 to 2005	BSE media coverage did not systematically affect fast food purchases among Alberta consumers.
Anders and Moeser, 2008	organic and conventional fresh beef	AIDS	ACNielsen retail scanner data 2000–2007	Organic beef is highly dependent on price and expenditures, whereas demand for conventional beef is mostly driven by income, habits and 'typical' Canadian seasonal beef consumption patterns

2.6 Summary of Literature Review

The chapter offers a comprehensive review of the issues about previous meat demand analyses. Based on the previous literature, "value added" in this study is defined as the level of value added processing in the meat products which returns higher value in live animal pieces to primary meat producers, and meat product price does not necessarily reflect whether the product adds value to the animal carcass. In addition, a comparison of consumers' preferences and attitudes is performed over the previous studies with respect to store-switching, brand loyalty and meat expenditure. Many analyses have been employed to explain consumers' choices about meat types, meat brands and where to shop. Previous meat demand studies provided a useful look at changes in price influencing consumer meat demand and purchase patterns. The previous studies provide a framework that can be used to address the first objective of the study, which is to determine the impacts of price elasticities by demographic and regional characteristics on meat purchase behaviour, and how these differences in behaviour vary across meat types.

The previous literature also shows that store choice, brand preference and household demographic characteristics affect consumers' demand, and advertising is a shifter of consumers' preference. The decision making process can follow a hierarchical process. However brand choice criteria, store selection and shopper characteristics are usually considered in isolation in previous studies (Baltas and Papastathopoulou, 2003). Although the hierarchy of decision making is not tested in this study, the focus is on the links between store choices and meat purchases by type, be brand and private label. Studies about Canadian meat demand and about different structures of the Canadian decision making process are limited in the literature. Thus, the study will contribute to an understanding of Canadian consumers' value added meat product preferences in the literature. In the next chapter, the data and methods used for the empirical estimation of the study are presented and the functional forms used for panel data modeling are also specified.

Chapter 3: Methods and Data Descriptive Statistics

3.1 Introduction

The previous chapter presents an in-depth literature review of the theoretical basis of meat demand analysis. Based on the comprehensive review of the issues related to meat demand analysis in the previous section, many different techniques will be employed in this study to explain consumers' choices about meat types, meat brands and where to shop. Different functional forms and model methodologies are applied to address the impacts of price elasticities and demographic and regional characteristics in meat purchase behaviour and these differences in the behaviour across meat types. This chapter will provide a brief review of flexible functional forms and demand systems that will be used in the study. Then the methods and empirical models used in the study are precisely specified and developed in the later section. The statistical descriptions of demographic data used in the study are given and a summary of the chapter is provided in the final section.

3.2 Description of Economic Models and Functional Forms

The approach often applied in modeling consumers' food consumed at home and food consumed away from home is the classical Engel's law. The original Engel's law demonstrates the relationship between consumers' expenditure and consumers' income. Engel (1857) states that food expenditures increase with household income and family size, but the share of food in household expenditure decreases with household income (namely total expenditure). For example, poorer households have a higher share of food in their total expenditure than that of richer households. Larger households devote a higher share of food in their total expenditure than that of smaller size households. An Engel curve (budget share) form usually describes how the expenditures are allocated on some good or service. Therefore Engel curves can be used as methods to classify goods into luxuries, necessities, and inferior goods (Deaton and Muelbauer, 1980). In recent empirical studies, the demand functions for

consumers' food at home behaviour have been extended to include household demographic variables beside prices and income variables, etc.. Many studies extend the traditional Engel curve function to include detailed household demographic and socio-economic variables to model households' consumption patterns.

In order to improve demand analysis, many flexible functional forms have been employed in demand studies, ranging from single demand models to demand systems. The most common functional forms used in demand studies are the Working (1943)-Leser (1963) demand model, the Translog model (Christensen et al., 1973; Griffin and Gregory, 1976), Rotterdam model (Barten, 1964; Theil, 1965) and the Almost Ideal Demand System (AIDS) model (Deaton and Muelbauer, 1980). Based on the popularity and the data availability for the study, the popular Working-Leser model (due to the lack of individual meat product price data, although aggregate meat prices by category will be included for estimation purposes) and the linear approximate almost ideal demand system (LA/AIDS) model functional forms are applied in the study to analyse the three demand models: value added meat choice, store choice and brand choice demand analyses. Next there will be a complete description and comparison between two of the most widely used functional forms: Working-Leser models and LA/AIDS models.

3.2.1 Working-Leser Demand System

The Working-Leser empirical model was originally proposed as a log-linear budget share specification to the model by Working (1943) and Leser (1963). Deaton and Muellbauer (1980) provide a further discussion of this specification. Basic Engel curve functions represent the relationship between consumption and consumer's income level. In addition, household consumption is also affected by demographic and socio-economic variables. For example, larger households usually spend more money on food than smaller households, which indicates that food consumption may be affected by household size.

In the Working-Leser model, each expenditure share on a food item or service is a linear function of the logarithm of the total expenditure and the model is extended to

include demographic effects on all food items or services in the model. The advantage of using this functional form in this study is, compared with almost ideal demand system (AIDS), price information is not necessary in the model specification, the Working-Leser functional form relates budget shares linearly to the logarithm of outlay, it can be expressed as (Deaton and Muelbauer, 1980, p.19):

$$\omega_i = a_0 + a_i * \log x + \sum_k \gamma_{ik} * D_k + \varepsilon_i$$

where (i) $\in$ food items and services,

ω_i = expenditure share of a particular food i among food items and services,

x= total expenditure of all food items or services included in the model

D_K indicates demographics and other variables, such as advertising variables.

ε_i is random disturbances assumed with zero mean and constant variance.

The adding up restriction requires that $\Sigma\omega i=1$, which is satisfied provided $\Sigma\alpha 0=1$, $\Sigma\alpha 1=0$, $\Sigma\gamma i=0$. The expenditure elasticity (ei) formula for the Working-Leser model can be expressed as (Chern et al., 2002, p. 15):

$$e_i = 1 + \left(\frac{a_i}{w_i} \right)$$

The uncompensated own (j=i) and cross (j≠i) price elasticities (eij) are as follows (Chern et al., 2002, p. 15):

$$e_i = -\delta_{ij} + \left(\frac{\beta_{ij}}{w_i} \right) \qquad \forall i, j = 1, ..., n$$

where δij is the Kronecker's delta, it is a function of two variables, usually integers, which is 1 if they are equal (if i = j), and 0 otherwise.

3.2.2 Almost Ideal Demand System (AIDS)

Proposed by Stone (1954), the Linear Expenditure System (LES) was widely applied for quite some time due to its advantage of linearity, transparency, and parsimony of the estimated parameters; however it has some strong restrictions on the proportionality between price and income elasticities. Later functional forms such as the Rotterdam model (Barten, 1964; Theil, 1965) and the Translog model (Christensen et al., 1973; Griffin and Gregory, 1976) corrected some of the shortcomings of the LES but still these models have their own limitations. Deaton and Muellbauer (1980) developed a demand system called the Almost Ideal Demand System (AIDS). The Almost Ideal Demand System (1980) provides an alternative which is appealing due to its simplicity in application. The Almost Ideal Demand System (AIDS) is derived from the maximization of an explicit indirect utility function which also corresponds to the minimization of a cost function of a price independent generalized logarithmic (PIGLOG) form. However, the AIDS model may be difficult to estimate because price information is required for each commodity to be able to include a price index in the model and the price index is not linear in parameters estimated. Therefore, only the AIDS model is applied to the brand choice model which has more price availability. Moreover due to simplicity, the linear approximate almost ideal demand system (LA/AIDS) which uses Stone's index is popular amongst empirical studies and therefore can be applied in this study. The general model for LA/AIDS is as below (Deaton and Muelbauer, 1980, p.75):

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln P_j + \beta_i \ln \frac{M}{P}$$

where ωi is the budget share of the ith good, M is the total consumption expenditure, Pj is the price of the jth good, P is a weighted average price based on Stone's price index which is in the form of:

$$\ln P = \sum_{i=1}^{n} \omega_i \log(p_i)$$

The AIDS model will satisfy adding-up, homogeneity, and symmetry properties derived from the standard demand theory of:

$$\sum_i \alpha_i = 1, \sum_i \beta_i = 0, \sum_i \gamma_{ij} = 0 \text{ (adding up)}$$

$$\sum_j \gamma_{ij} = 0 \text{ (homogeneity)}$$

$$\gamma_{ij} = \gamma_{ji} \text{ (symmetry).}$$

With homogeneity and symmetry restrictions, the budget shares will add to one. Therefore one equation in the AIDS demand system must be dropped to avoid the problem of perfect multicollinearity due to the adding-up condition. The price and income coefficients associated with the dropped equation can be recaptured via the symmetry and homogeneity conditions.

Followed by Green and Alston (1990), the demand elasticities of the LA/AIDS models can be computed at sample means. The expenditure elasticities can be estimated by (Green and Alston, 1990, p.443):

$$e_i = \frac{\beta_i}{\overline{\omega}_i} + 1$$

The Marshallian measures of price elasticities can be computed by (Green and Alston, 1990, p.443):

$$s_{ij} = -\delta_{ij} + \left(\frac{\gamma_{ij}}{\overline{\omega}_i}\right) - \left(\frac{\beta_i}{\overline{\omega}_i}\right)\overline{\omega}_j$$

where δ_{ij} is the Kronecker delta that is one if $i = j$ and zero otherwise.

3.2.3 The Choice of Functional Forms in the Study

Although models and flexible functional forms like the Almost Ideal Demand System (AIDS) are superior and advanced in theory, they have their own limitations. The estimation of these demand systems requires expenditure proportions which can be calculated only when the price information for each food item is available. However the price data availability varies across the three models in this study as follows:

1. In the first value added meat choice models, the data source, ACNielsen Homescan™ panel data, does not record the price information for each fresh/random weighted meat item purchased by the household and prices for each meat product are not available from other sources (e.g., Statistics Canada). Thus proxy meat prices calculated from ACNielsen MarketTrack™ data are used. All households in the same region and same year face the same prices for the meat products. For estimation purposes, only the own meat prices are included in the model. Therefore the Working-Leser demand system is applied in the first meat choice models since it does not require full price information for the estimation.

2. For the second store choice model, ACNielsen Homescan™ panel data does not provide general price levels for each grocery store chain in the model. Thus the LA/AIDS model may not be feasible for the second model estimation of the demand study either. Therefore the Working-Leser demand system is applied in the second store choice models for estimation.

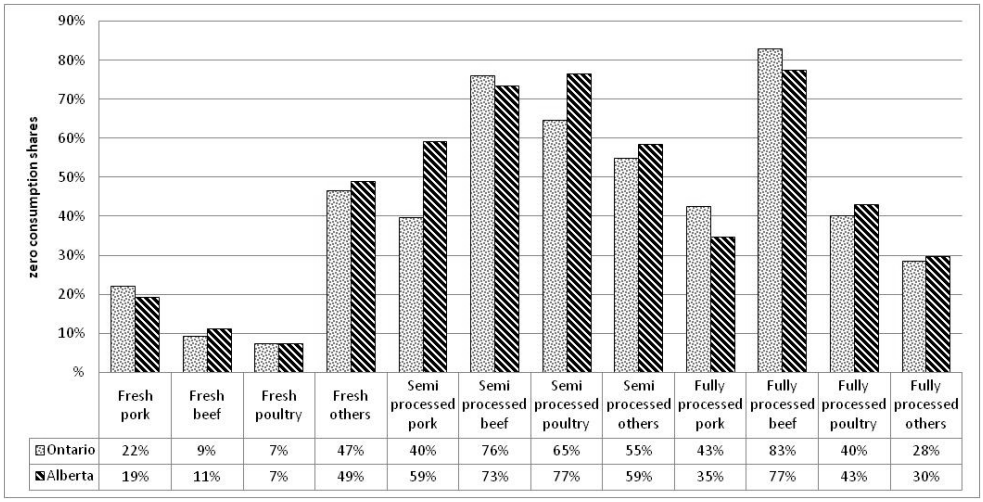
3. For the third brand choice models, although ACNielsen Homescan™ panel data does not record price information for each fresh meat product purchased by the households, most of the fully processed meat products in the data are UPC coded (compared with random weighted meat in the first model), which does have the quantity and value information. In this way, price information is available and prices per unit of each branded meat can be calculated by dividing total expenditure by total quantity, however these retail prices are available only for the households that actually made purchases. For the households that chose not to purchase a product in a given period, the price for that product they do not choose to purchase is not recorded,

so the average price from those households who purchased the meat in the same year is applied. Thus, the LA/AIDS demand system can be used for the third brand choice estimation model.

3.3 Two-Step Estimation of a Censored System of Equations

Zero consumption is another issue in the modeling of household choices. Zero purchase expenditure is a common problem in empirical estimation when using micro level data. Especially in household survey data, zero consumption can result from infrequency of purchase, sensitivity to product prices or other reasons. Figures 3.1-3.3 below present the percentage of respondents with zero consumption in each model (also shown in Appendix B). In the first meat choice analysis, fresh meat purchasing has a lower rate of zero consumption, and over 75 percent of semi-processed and fully processed beef consumption observations are zero, indicating that the processed beef category has a very small share in households' meat purchasing. In the second store choice analysis, for comparison purposes with Alberta, Co-op and Safeway in Ontario are selected although they have a relatively high zero consumption rate by individual households. In the third brand choice models, store brand pork products have a higher rate of zero consumption, over 80 percent of the store brand pork consumption observations are zero.

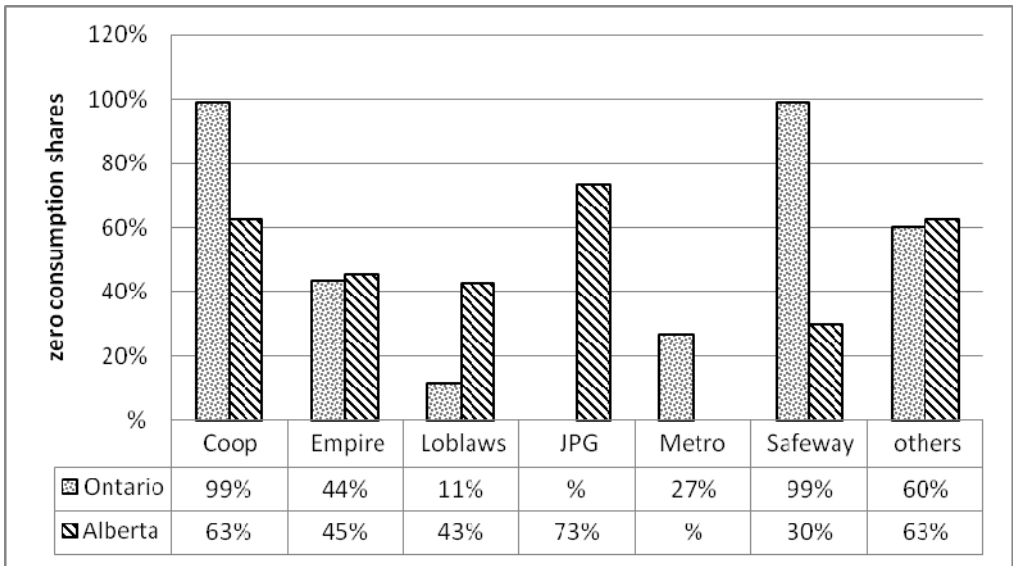
Figure 3.1 Average percentages of Ontario and Alberta households with zero consumption in meat choice models 2002-2007



	Fresh pork	Fresh beef	Fresh poultry	Fresh others	Semi processed pork	Semi processed beef	Semi processed poultry	Semi processed others	Fully processed pork	Fully processed beef	Fully processed poultry	Fully processed others
Ontario	22%	9%	7%	47%	40%	76%	65%	55%	43%	83%	40%	28%
Alberta	19%	11%	7%	49%	59%	73%	77%	59%	35%	77%	43%	30%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007, Ontario and Alberta.

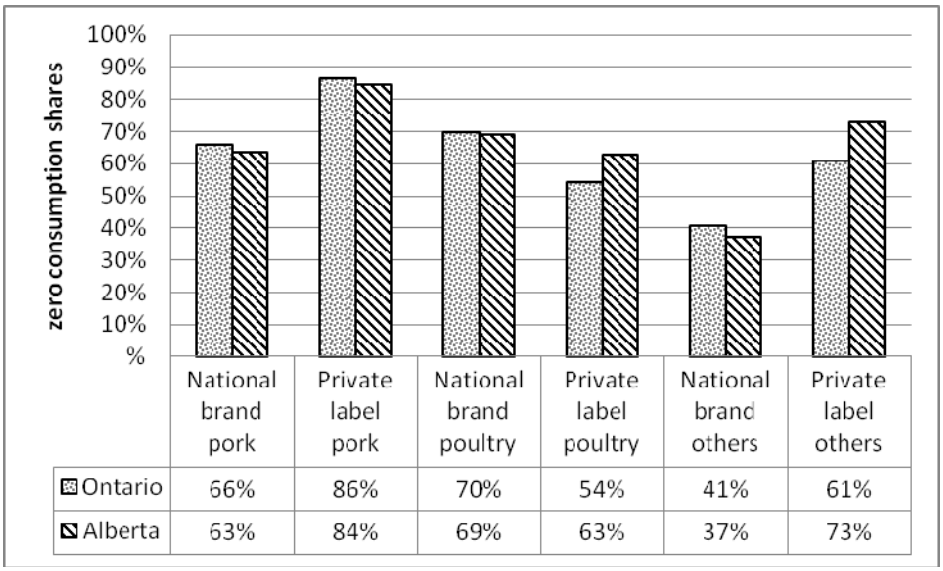
Figure 3.2 Average percentages of Ontario and Alberta households with zero consumption in store choice models 2002-2007



	Coop	Empire	Loblaws	JPG	Metro	Safeway	others
Ontario	99%	44%	11%	%	27%	99%	60%
Alberta	63%	45%	43%	73%	%	30%	63%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007, Ontario and Alberta.

Figure 3.3 Average percentages of Ontario and Alberta households with zero consumption in brand choice models 2002-2007



	National brand pork	Private label pork	National brand poultry	Private label poultry	National brand others	Private label others
Ontario	66%	86%	70%	54%	41%	61%
Alberta	63%	84%	69%	63%	37%	73%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007, Ontario and Alberta.

Various methods can be applied in empirical estimation to deal with the zero consumption problems. One of the most common approaches is two-step estimation of a censored system of equations. As the zero consumption percentages are high in the data for the study, some appropriate temporal aggregations are made to solve the zero consumption problem in the panel data, and also the two-step estimation procedure is used. In this section, a review of the two-step approaches used in previous empirical estimation is provided.

3.3.1 Tobit Model

The Tobit model was proposed by Tobin (1958) and it has been widely applied to demand analysis to address the issue of censored variables. The approach can be used to measure the participation decision and to examine consumption levels in the model. The specification can provide consistent and efficient results when observations of the dependent variable are censored (Tobin, 1958; Kinsey, 1981; Cornick et al., 1994). The general form for the Tobit model is shown below (Greene, 2003, p.764):

$$y_i^* = \beta x_i + \varepsilon_i, \quad \varepsilon_i \sim N(0, \sigma^2),$$

$$y_i = y_i^* \text{ if } y_i^* > 0,$$

$$y_i = 0 \text{ if } y_i^* \leq 0;$$

where y_i^* is the dependent variable of a particular *i*th observation, x_i is the exogenous variables, β is the conformable vector of parameters, and ε_i are the random errors. The conditional mean can be expressed below (Greene, 2003, p.764),

$$E[y_i] = \Phi\left(\frac{x_i'\beta}{\sigma}\right)\left(x_i'\beta + \sigma\lambda_i\right)$$

where:

$$\lambda_i = \frac{\phi\left[(0 - x_i'\beta/\sigma\right]}{1 - \Phi\left[(0 - x_i'\beta/\sigma\right]} = \frac{\phi\left(x_i'\beta/\sigma\right)}{\Phi\left(x_i'\beta/\sigma\right)}$$

3.3.2 Double-Hurdle Model

Cragg (1971) first proposed the double-hurdle model, which is developed from generalization of the Tobit model, and identifies the individual's purchasing decision process in two steps. The double-hurdle model has two advantages which include not only solving the zero consumption purchase problem; it also suggests the dynamics of the purchase decision making process. It is a special case of the Tobit model and it involves the following two steps:

in the first step a Probit ML estimator is used to obtain the probability of the censored observations from the entire sample of data (Greene, 2003, p.750):

$$\Pr\left(y_i = 0 \middle| y_i^* \leq 0\right) = \Phi\left(-x_i\beta_i\right),$$

in the second step, the density of yi is assumed to be normal and truncated at zero, then a truncated normal estimator is used to estimate β_i and σ of the equation below (Greene, 2003, p.750):

$$f(y_i \mid y_i^* > 0) = \left\{1/\sigma\phi\left(\left[y_i - x_i\beta_2\right]/\sigma\right)\right\}/\phi\left(x_i\beta_2/\sigma\right).$$

3.3.3 Heckman Two-step Procedure

Heckman (1979) proposed a two-step estimation (Heckit) procedure to correct the zero consumption problem. It is also a two step estimation method which can provide consistent estimates of the parameters. The model is as listed below (Greene, 2003, p.784):

$$y_i^* = X_i'\beta + \varepsilon_i, \quad d_i^* = z_i'\alpha + \upsilon_i$$

$$[\varepsilon_i, \upsilon_i] \sim \text{bivariate normal } [0, 0, \sigma_{2,}p, 1]$$

$$d_i = 1 \text{ if } d_i^* > 0$$

$$d_i = 0 \text{ if } d_i^* \le 0$$

$$y_i = d_i y_i^*, \text{ (i=1, 2, …, n)}$$

In the first step, a probit equation is estimated by maximum likelihood procedures to estimate the probability that a household consumes a given food item (Greene, 2003). The calculation is called Inverse Mills ratio, which is in the form below (Greene, 2003, p.784):

$$\lambda_i = \frac{\phi\left(z_i'\hat{a}_i\right)}{\Phi\left(z_i'\hat{a}_i\right)}$$

The second step is a linear least squares regression of the dependent variable y_i^* on X_i and the Inverse Mills Ratio which is used as an instrumental variable for the non-zero (censored) variables in the model (Greene, 2003, p.784):

$$E\left[y_i^* \left| x_i, d_i = 1 \right.\right] = x_i^{'}\beta + E\left[\varepsilon_i \left| x_i, d_i = 1 \right.\right] = x_i^{'}\beta + \theta\lambda_i$$

3.3.4 Heien and Wessells Two-step Procedure

Based on Heckman's (1979) two step procedure, the Heien and Wessells' two step procedure has been widely used in applied demand analysis. In contrast to the Heckman's two step estimation procedure which only estimates the censored (non-zero) observations in the second step, the HW estimation procedure uses the whole data sample (both limit and nonlimit variables) observations. In the same way as the Heckman' s model in the first step, Heien and Wessells' two-step procedure is (Heien and Wessells, 1990, p.365):

$$y_i^* = X_i^{'}\beta + \varepsilon_i, \quad d_i^* = z_i^{'}\alpha + \upsilon_i$$

$$d_i = 1 \text{ if } d_i^* > 0$$

$$d_i = 0 \text{ if } d_i^* \le 0$$

$$y_i = d_i y_i^*, \text{ (i=1, 2, …, n).}$$

In the first step of the HW procedure, elements of $\hat{a}_i$ for each i are estimated using the Probit estimates (Heien and Wessells, 1990, p.365):

$$pr(d_{ij} = 1) = f(z_{ij}a) = \Phi(z_{ij}^{'}\hat{a}) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_{ij}^{'}a_{ij}} \exp \frac{-(z_{ij}^{'}a_i + \upsilon_{ij})^2}{2} d(z_{ij}^{'}a_i + \upsilon_{ij}),$$

$$pr(d_{ij} = 0) = f(z_{ij}a) = 1 - \Phi(z_{ij}^{'}\hat{a}) = 1 - \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_{ij}^{'}a_{ij}} \exp \frac{-(z_{ij}^{'}a_i + \upsilon_{ij})^2}{2} d(z_{ij}^{'}a_i + \upsilon_{ij}).$$

In the second step of the HW procedure, the Inverse Mills Ratio (IMR) is calculated below is (Heien and Wessells, 1990, p.365):

$$IMR_{ij} = \frac{\phi(z_{ij}^{'}\hat{a}_i)}{\Phi(z_{ij}^{'}\hat{a}_i)} \text{ if } d_{ij}=1,$$

$$IMR_{ij} = \frac{\phi(z_{ij}^{'}\hat{a}_i)}{1-\Phi(z_{ij}^{'}\hat{a}_i)} \text{ if } d_{ij}=0.$$

The Inverse Mill Ratio is then applied to the system of equations in the second step as an instrumental variable. The system of equations can be estimated with the Seemingly Unrelated Regression (SUR) estimator.

3.3.5 Shonkwiler and Yen Two-step Procedure

Another two step estimation approach has been proposed by Shonkwiler and Yen (1999). They based the estimation procedure on the Heien and Wessells (1990) two step estimation and demonstrated a consistent estimation procedure for a system of equations with limited dependent variables.

In the first step of the Shonkwiler and Yen two-step procedure, they applied a similar estimation method to the Heien and Wessells approach. A probit model is estimated on $d_{ij}^{*} = z_{ij}^{'}\alpha_i + \upsilon_{ij}$ to get $\hat{\alpha}_i$ out of α_i. Then in the second step, $\Phi(z_{ij}^{'}\hat{a}_i)$ and $\phi(z_{ij}^{'}\hat{a}_i)$ are calculated and $\hat{\beta}_i$ and $\hat{\delta}_i$ are incorporated into the equation system, which is as below (Shonkwiler and Yen, 1999, p. 973-974),

$$y_{it} = \Phi\left(z_{it}^{'}\hat{\alpha}_i\right) f\left(X_{it}, \beta_i\right) + \delta_i \phi(z_{it}^{'}\hat{\alpha}_i) + \xi_{it}.$$

3.3.6 Econometric Method Selection

Food-at-home (FAH) consumption can be seen as a two step decision making process. In the first step consumers focus on the decision of whether or not to consume FAH, which is known as a participation step. In the second step, the

decision is made about the level of consumption or expenditure on the food item or service, which is known as expenditure step. In order to find a suitable two step approach for the study, comparisons of the estimation procedures are discussed in the section.

Multi-step decision making processes have problems of potential bias and inconsistency resulting from censored responses (Byrne and Capps, 1996). The Tobit estimation procedure has the advantage of estimation response for both participation and expenditure decisions. However Tobit analysis is a single parameter estimate for each explanatory variable, which imposes a restriction that the effects of the explanatory variables on both participation decision and expenditure decision should be the same. For example, certain variables that increase the probability of the participation decision must also have a positive effect on the expenditure levels. But it may not be always the case, some households may have a higher participation rate in one region but may spend less than those in other regions (Byrne and Capps, 1996).

The double-hurdle model is an appropriate method of dealing with the zero consumption problems in household survey data (Jones and Yen, 2000). The double-hurdle model provides estimates of the parameters separately for both decision making processes. Yen (1992) applied the double-hurdle approach to estimate a one-time reporting of expenditure over a one-week time period, which may result in a problem of a high purchase infrequency rate (Byrne and Capps, 1996). However, a limitation of the double-hurdle model specification is the procedure is based on bivariate normality assumptions for the error distribution, it may cause inconsistency problems if the normality assumption is violated (Arabmazar and Schmidt, 1982).

The Heckman two-step estimation procedure is also based on the Tobit model. The estimation method can produce consistent estimates of the parameters following the two step procedure. However it has been shown that the Heckman two-step procedure only includes the participating households in the second step of the model. This may cause concerns with the efficiency of the method and the estimated results might only suit the households that participated (Nawata, 1993; Vermeulen, 2001).

The Heien and Wessells two step model is based on the Heckman's approach and uses the same households in both of the steps, thus it solves the problem of the Heckman two-step model mentioned above. According to Heien and Wessells (1990), their approach improved results based on the goodness-of-fit and elasticity values. They concluded that the procedure is not only computationally simple to apply in the demand analysis but also is consistent and more efficient than other two-step estimators (Byrne and Capps, 1996). Shonkwiler and Yen (1999) argue that Heien and Wessells' procedure may have inconsistent estimators and they propose an alternative estimation procedure for a system of equations with limited dependent variables. However due to the large zero consumption percentage in the data set and its simple computation for the demand analysis, and the fact that the Heien and Wessells two step estimator has been a favourite choice for empirical analysis in demand analysis (Shonkwiler and Yen, 1999), the Heien and Wessells' two step procedure is chosen as the desirable framework for the three demand analyses in the study. Table 3.1 provides a summary of previous two step estimation models.

Table 3.1 Summary of previous two step estimation models

	Mergenthaler et al., 2009	**Chern et al., 2002**	**Schmit et al., 2000**	**Byrne and Capps, 1996**	**Lanfranco et al., 2001**	**Tey et al., 2009**	**Salvanes and Devoretz, 1997**	**Jabarin, 2005**	**Garcia et al., 2005**	**West and Williams, 2004**	**Lazaridis, 2004**	**Malaga et al., 2006**	**Han et al., 2001**
Data	survey data	cross-sectional data	panel data	survey data	cross-sectional data	survey data	survey data	panel data	survey data	survey data	survey data	survey data	survey data
2 step model	1st : Probit, IMR 2nd: AIDS	Working-Leser Model, AIDS	Shonkwiler and Yen 1999 2 steps	Heien and Wessells 1990	Shonkwiler and Yen (1999)	Heien and Wessells 1990	1st : Probit, IMR 2nd: AIDS	1st : Probit, IMR 2nd: LA/AIDS	1st : Probit, IMR 2nd: QUAIDS	1st : Probit, IMR 2nd: LA/AIDS	1st : Probit, IMR 2nd: LA/AIDS	1st : Probit, IMR 2nd: L/QUAIDS	1st : Probit, IMR 2nd: LA/AIDS
Based on model	Heien and Wessells 1990	Heien and Wessells 1990	Shonkwiler and Yen 1999 2 steps	Heien and Wessells 1990	Shonkwiler and Yen 1999 2 steps	Heien and Wessells 1990	Heien and Wessells 1990	Heien and Wessells 1990	Heien and Wessells 1990	Heien and Wessells 1990	Heien and Wessells 1990	Heien and Wessells 1990	Heien and Wessells 1990
Model fit test	LRT test, F-test,		t-test	LRT test		pseudo-R2		wald test	pseudo-R2	t-test	pseudo-R2	pseudo-R2	Wilks' Lambda test
Variables in the model													
Household size			(+,*) [-,*]	(m,*) [+,*]		[+,*]			[-,*]		(-,m)		
Family income			(m,*) [-,*]	(+,*) [-,*]		[+,*]							
Hours worked													
Gender						[m,m]							
Education	(m,) [m, *]		(m,*) [m,*]								(+,m) [+,m]		
Age			(m,*) [m,*]			[-,*]	[+,m]			(m,*)	(m,*) [m,m]		
Total expenditure	(m,*) [m,*]						[m,*]			(m,*)			
Household													

	Mergenthaler et al., 2009	Chern et al., 2002	Schmit et al., 2000	Byrne and Capps, 1996	Lanfranco et al., 2001	Tey et al., 2009	Salvanes and Devoretz, 1997	Jabarin, 2005	Garcia et al., 2005	West and Williams, 2004	Lazaridis, 2004	Malaga et al., 2006	Han et al., 2001
composition													
Pirce level													
Employed						[+,*]	[-,*]						
Kid			(m,*) [-,*]						[-,*]	(m,*)			
Imr	[+,*]			[m,*]		[+,*]	[m,m]		[-,*]	[m,m]	[+,*]		
Vehicle owned	(-,)												
Urban	(-,)		(m,m) [m,m]			[+,*]	[m,*]						
Own price	(m, *) [m,m]												
Lagged advertising			(m,*) [m,*]										

Note: **"-" and "+" denote the sign of parameters**

"*" denotes the parameters are statistically significant

" " denotes the parameters are not statistically significant

"m" denotes a combination of positive and negative sign or significant and not significant variables

( ) denotes first stage Probit model

[ ] denotes second stage expenditure model

3.4 Data and Descriptive Statistics

This research study mainly contains three analyses: consumers' meat purchases demand analysis, consumers' store choice analysis, and analysis about brand choices between national brands and private labels (store brands) for the fully processed meat category. The data for the three analyses are sourced from the ACNielsen Homescan™ panel data for calendar years 2002 through 2007. These data are taken from a sample of households that are representative of the Canadian population (as shown in Table 3.2). Each household was provided with a scanner machine by ACNielsen with which they could scan and record all items purchased in different grocery stores in given period, as well as demographic information about the household.

ACNielsen Homescan™ panel data is a unique dataset that consists, in this case, of all meat purchases of 16,515 Canadian households from 2002 to 2007. Meat purchase categories include fresh and frozen meat cuts of both random weighted and UPC coded products. The database also contains socioeconomic and demographic characteristics of the households such as age, income, region, house size and education, presence of children, etc.. Not all participant households stayed in the panel in all six years from 2002 to 2007. Table 3.3 shows the proportion of households that stayed in the panel for all years. In addition, some of the households dropped out of the panel and other households participated in the panel for subsequent years. In order to effectively address the study objectives, the data used for the empirical analysis is a balanced panel from 2002 to 2007 after excluding households not participating over the entire six-year period. The final balanced panel data sample covers households who stayed in the panel and had purchase information in all six years, leading to a total of 4322 households at the national panel and 508 households in Alberta and 1036 households in Ontario. All the expenditure and quantity data have been aggregated to yearly data to control for the large number of zero observations. Meat and store expenditure data are expressed in terms of Canadian dollars.

Table 3.2 Comparing sample data with 2006 Census profile of Canada

	ACNielsen Homescan™		***2006 Census Profile Canada***		
Region	(n=4322)				
Maritimes	14%			8%	
Quebec	25%			24%	
Ontario	25%			39%	
Man/Sask	10%			7%	
Alberta	13%			10%	
BC	13%			13%	
Household Head Age	**Ontario**	**Alberta**	**Canada**	**Ontario**	**Alberta**
18-34	2%	5%	19%	19%	22%
35-44	19%	18%	15%	16%	15%
45-54	26%	30%	16%	15%	16%
55-64	22%	22%	12%	11%	10%
65+	31%	24%	14%	14%	11%
Household Size	**Ontario**	**Alberta**	**Canada**	**Ontario**	**Alberta**
Single Member	25%	27%	27%	24%	25%
Two Members	40%	40%	34%	32%	34%
Three Members	14%	12%	16%	17%	16%
Four Members	13%	14%	15%	17%	16%
Five - Nine Plus Members	8%	7%	9%	11%	10%
Age & Presence of Children	**Ontario**	**Alberta**	**Canada**	**Ontario**	**Alberta**
No children	78%	78%	77%	75%	82%
Have children	22%	22%	23%	25%	18%
Household Head Education	**Ontario**	**Alberta**	**Canada**	**Ontario**	**Alberta**
Not high school grad	14%	13%	24%	22%	23%
High school graduate	15%	18%	26%	27%	26%
College or university	71%	69%	51%	51%	50%
Income	**Ontario**	**Alberta**	**Canada**	**Ontario**	**Alberta**
< $20,000	9%	8%	7%	7%	5%
$20,000-$29,999	12%	14%	9%	8%	6%
$30,000-$39,999	12%	13%	13%	11%	10%
$40,000-$49,999	11%	11%	13%	11%	11%
$50,000-$69,999	19%	19%	22%	21%	22%
$70,000+	38%	36%	36%	42%	45%
National Urban vs. Rural	**Ontario**	**Alberta**	**Canada**	**Ontario**	**Alberta**
Rural	32%	31%	19%	15%	17%
Urban	68%	69%	81%	85%	83%

Source: Statistics Canada, Census 2006 and ACNielsen Homescan™ panel data 2002-2007.

Table 3.3 Number of households that participated in the panel by year

Year	*Number of participating Canadian households*
2002	9580
2003	9231
2004	10044
2005	9933
2006	9304
2007	9582

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007, Ontario and Alberta.

ACNielsen Homescan™ panel data has detailed information on household socioeconomic and demographic characteristics for each of the panellists. The sample data used in all three studies in the study focuses on household panellists in Ontario and Alberta for calendar years 2002 through 2007. The socioeconomic and household demographics used in all three studies in the study include: household size, household income, household head age, education, and presence of children, language, urbanization, and province. In this section, the definitions of household demographic variables used in the empirical analyses are provided. In addition, descriptive statistics in the study sample between households in the province of Ontario and Alberta are comparatively discussed. Then in the later chapters, detailed purchase data information description will be offered in each chapter.

Income

Household incomes are recorded as a categorical variable in ACNielsen Homescan™ panel data. The mid-point method is used to approximate income levels by a continuous measure. Tables 3.4 and 3.5 present the income classes and mid-point values for the sample data and Census 2006. The frequency distribution by each year implies that study sample is representative of income classes in the ACNielsen Homescan™ panel data.

Table 3.4 Income classes and mid-point value for the sample data for Ontario

Income class (CAD$)	Midpoints	YEAR	ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
< $20,000	10000	Count	100	100	89	90	90	73	542	7.1%	6.6%
		HH%	9.7%	9.7%	8.6%	8.7%	8.7%	7.0%	8.7%		
$20,000-$29,999	24999.5	Count	123	123	140	125	125	114	750	9.2%	7.6%
		HH%	11.9%	11.9%	13.5%	12.1%	12.1%	11.0%	12.1%		
$30,000-$39,999	34999.5	Count	126	126	131	122	122	119	746	12.6%	10.9%
		HH%	12.2%	12.2%	12.6%	11.8%	11.8%	11.5%	12.0%		
$40,000-$49,999	44999.5	Count	115	115	109	119	119	112	689	12.6%	11.3%
		HH%	11.1%	11.1%	10.5%	11.5%	11.5%	10.8%	11.1%		
$50,000-$69,999	59999.5	Count	206	206	186	189	189	179	1155	22.3%	21.5%
		HH%	19.9%	19.9%	18.0%	18.2%	18.2%	17.3%	18.6%		
$70,000+	74999.5	Count	366	366	381	391	391	439	2334	36.3%	42.0%
		HH%	35.3%	35.3%	36.8%	37.7%	37.7%	42.4%	37.5%		
Total		Count	1036	1036	1036	1036	1036	1036	6216		
		HH%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		

Source: Statistics Canada, Census 2006 and ACNielsen Homescan™ panel data 2002-2007.

Table 3.5 Income classes and mid-point value for the sample data for Alberta

Income class (CAD$)	Midpoints	YEAR	ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
< $20,000	10000	Count	43	43	38	39	39	30	232	7.1%	5.4%
		HH%	8.5%	8.5%	7.5%	7.7%	7.7%	5.9%	7.6%		
$20,000-$29,999	24999.5	Count	78	78	74	68	68	55	421	9.2%	6.4%
		HH%	15.4%	15.4%	14.6%	13.4%	13.4%	10.8%	13.8%		
$30,000-$39,999	34999.5	Count	69	69	62	63	63	65	391	12.6%	10.2%
		HH%	13.6%	13.6%	12.2%	12.4%	12.4%	12.8%	12.8%		
$40,000-$49,999	44999.5	Count	55	55	56	54	54	55	329	12.6%	10.9%
		HH%	10.8%	10.8%	11.0%	10.6%	10.6%	10.8%	10.8%		
$50,000-$69,999	59999.5	Count	107	107	104	92	92	76	578	22.3%	21.7%
		HH%	21.1%	21.1%	20.5%	18.1%	18.1%	15.0%	19.0%		
$70,000+	74999.5	Count	156	156	174	192	192	227	1097	36.3%	45.5%
		HH%	30.7%	30.7%	34.3%	37.8%	37.8%	44.7%	36.0%		
Total		Count	508	508	508	508	508	508	3048		
		HH%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		

Source: Statistics Canada, Census 2006 and ACNielsen Homescan™ panel data 2002-2007.

As shown in Table 3.4, in Ontario the aggregate frequency of income classes: less than $20,000, $20,000-$29,999 and $30,000-$39,999 are higher in the ACNielsen panel data than in the Census 2006. This difference is compensated for with a lower frequency of income class of $50,000-$69,999 and $70,000 plus in ACNielsen Homescan™ panel than in Census 2006. The same distribution also appears in Alberta. The aggregate frequency of income classes in Alberta: less than $20,000, $20,000-$29,999 and $30,000-$39,999 are higher in ACNielsen Homescan™ panel data than in Census 2006, and $50,000-$69,999 and $70,000 plus income class have a lower frequency in ACNielsen Homescan™ panel data than in Census 2006. The difference indicates that lower income households participate more in these survey activities than households in the higher income class. When compared over time, it appears that for both Alberta and Ontario, the proportion of higher income classes (e.g. more than $70,000) is increasing and the lower income classes (e.g. less than $20,000) is decreasing. The increase in the percentage of households with higher incomes is observed over the study period, which provides the information that there is an increase in income for the households that stay in the panel from 2002 to 2007.

Household Head Age

Household head age is recorded as a categorical variable in the ACNielsen panel data as well. The same mid-point method is used to approximate household head age levels by a continuous measure. Tables 3.6 and 3.7 present the household head age classes and mid-point values for the sample data. As appears in both tables, the aggregate frequency of younger household age classes, 18-34, is much lower in ACNielsen panel data than in Census 2006. However the percentage of older household classes, 45-54, 55-64, 65+, are higher in the ACNielsen Homescan™ panel data. This implies that younger households do not participate in the panel at the same rate as mid- or older headed households participate. Both tables also show that the proportion of older households is increasing over the given period, and the households that stayed in the panel are tending to be older households.

Table 3.6 Household head age classes and mid-point value for the sample data for Ontario

HH AGE CLASS	ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
	2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
18-34	42 4.10%	42 4.10%	16 1.50%	16 1.50%	16 1.50%	6 0.60%	138 2.20%	19.00%	19.00%
35-44	230 22.20%	230 22.20%	204 19.70%	189 18.20%	189 18.20%	146 14.10%	1188 19.10%	15.00%	16.00%
45-54	268 25.90%	268 25.90%	271 26.20%	265 25.60%	265 25.60%	265 25.60%	1602 25.80%	16.00%	15.00%
55-64	233 22.50%	233 22.50%	226 21.80%	233 22.50%	233 22.50%	227 21.90%	1385 22.30%	12.00%	11.00%
65+	263 25.40%	263 25.40%	319 30.80%	333 32.10%	333 32.10%	392 37.80%	1903 30.60%	14.00%	14.00%
Total	1036 100.00%	1036 100.00%	1036 100.00%	1036 100.00%	1036 100.00%	1036 100.00%	6216 100.00%		

Source: Source: Statistics Canada - 2006 Census. Catalogue Number 97-551-XCB2006012.and ACNielsen Homescan™ panel data 2002-2007.

Table 3.7 Household head age classes and mid-point value for the sample data for Alberta

HH Age class	ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
	2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
18-34	46 9.10%	46 9.10%	25 4.90%	16 3.10%	16 3.10%	8 1.60%	157 5.20%	19.00%	22.00%
35-44	108 21.30%	108 21.30%	99 19.50%	87 17.10%	87 17.10%	73 14.40%	562 18.40%	15.00%	15.00%
45-54	150 29.50%	150 29.50%	155 30.50%	158 31.10%	158 31.10%	151 29.70%	922 30.20%	16.00%	16.00%
55-64	99 19.50%	99 19.50%	111 21.90%	120 23.60%	120 23.60%	129 25.40%	678 22.20%	12.00%	10.00%
65+	105 20.70%	105 20.70%	118 23.20%	127 25.00%	127 25.00%	147 28.90%	729 23.90%	14.00%	11.00%
Total	508 100.00%	508 100.00%	508 100.00%	508 100.00%	508 100.00%	508 100.00%	3048 100.00%		

Source: Statistics Canada - 2006 Census. Catalogue Number 97-551-XCB2006012 and ACNielsen Homescan™ panel data 2002-2007.

Household Size

The household size variable measures the number of members in the household. ACNielsen panel record the household size in five groups. Household size equal to one, means there is only a single member in the household, two means two members in the household, and so forth. Household size equal to five means there are five or more than five members in the household. Tables 3.8 and 3.9 show the proportion of households with different household sizes for the sample data and Census 2006.

Table 3.8 Household size for the sample data for Ontario

HH size	ACNielsen Homescan™ panel data 2002-2007, Ontario							Census, 2006	
	2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
1	247 23.8%	247 23.8%	255 24.6%	259 25.0%	259 25.0%	261 25.2%	1528 24.6%	27.0%	24.0%
2	396 38.2%	396 38.2%	410 39.6%	417 40.3%	417 40.3%	452 43.6%	2488 40.0%	34.0%	32.0%
3	166 16.0%	166 16.0%	156 15.1%	132 12.7%	132 12.7%	133 12.8%	885 14.2%	16.0%	17.0%
4	137 13.2%	137 13.2%	139 13.4%	149 14.4%	149 14.4%	124 12.0%	835 13.4%	15.0%	17.0%
5 or 5+	90 8.7%	90 8.7%	76 7.3%	79 7.6%	79 7.6%	66 6.4%	480 7.7%	9.0%	11.0%
Total	1036 100.0%	1036 100.0%	1036 100.0%	1036 100.0%	1036 100.0%	1036 100.0%	6216 100.0%		

Table 3.9 Household size for the sample data for Alberta

HH size	ACNielsen Homescan™ panel data 2002-2007, Alberta							Census, 2006	
	2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
1	133 26.2%	133 26.2%	134 26.4%	137 27.0%	137 27.0%	146 28.7%	820 26.9%	27.0%	25.0%
2	192 37.8%	192 37.8%	210 41.3%	211 41.5%	211 41.5%	213 41.9%	1229 40.3%	34.0%	34.0%
3	63 12.4%	63 12.4%	64 12.6%	62 12.2%	62 12.2%	55 10.8%	369 12.1%	16.0%	16.0%
4	78 15.4%	78 15.4%	61 12.0%	67 13.2%	67 13.2%	61 12.0%	412 13.5%	15.0%	16.0%
5 or 5+	42 8.3%	42 8.3%	39 7.7%	31 6.1%	31 6.1%	33 6.5%	218 7.2%	9.0%	10.0%
Total	508 100.0%	508 100.0%	508 100.0%	508 100.0%	508 100.0%	508 100.0%	3048 100.0%		

Household education

The household education variable indicates the level of the household head's education. ACNielsen Homescan™ panel records the household head education at six levels: not high school grad; high school graduate; some college or tech; college or tech grad; some university; university graduate. The six categories of education levels were into two groups: no high school education and otherwise. The education dummy variable (HHEDU1) is then created with a value of one if the household has some high school or higher education and zero otherwise. The descriptive statistics for the household education level are listed below in Table 3.10.

Table 3.10 Household education for the sample data of Ontario/Alberta and Census 2006

Education levels	ACNielsen Homescan™ panel data 2002-2007, Ontario							Census, 2006	
	2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
No high school education	151 14.6%	151 14.6%	145 14.0%	145 14.0%	145 14.0%	131 12.6%	868 14.0%	24.0%	22.0%
Otherwise	885 85.4%	885 85.4%	891 86.0%	891 86.0%	891 86.0%	905 87.4%	5348 86.0%	77.0%	78.0%

Education levels	ACNielsen Homescan™ panel data 2002-2007, Alberta							Census, 2006	
	2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
No high school education	73 14.4%	73 14.4%	67 13.2%	63 12.4%	63 12.4%	57 11.2%	396 13.0%	24.0%	23.0%
Otherwise	435 85.6%	435 85.6%	441 86.8%	445 87.6%	445 87.6%	451 88.8%	2652 87.0%	77.0%	76.0%

Source: Statistics Canada, Census 2006 and ACNielsen Homescan™ panel data 2002-2007.

Presence of Children

ACNielsen Homescan™ panel records the presence and the age of children in the household information with nine categories: under 6 only; age 6 to 12 only; age 13 to 17 only; under 6 and age 6 to 12; under 6 and age 13 to 17; age 6 to 12 and age 13 to 17; under 6, age 6 to 12 and age 13 to 17 and no children under 18. In the study, two dummy variables are created to define the presence of children information. The dummy variable (KID1) is created with a value of one if the household has presence of children (aged under 18) and zero otherwise. Dummy variable (KID0) has a value of one if the household has no children under 18 and zero otherwise. The descriptive statistics for the presence of children are listed below in Tables 3.11 and 3.12. In the study sample, it appears that over three quarters of the households are without presence of children under age of 18. And increases in the percentage of households without children can be observed in both Ontario and Alberta over the study period.

Table 3.11 Households with children for the sample data of Ontario and Census 2006

Children	YEAR	ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
		2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
Without presence of children	Count	781	781	809	807	807	844	4829	77.00%	75.00%
	HH%	75.40 %	75.40 %	78.10 %	77.90 %	77.90 %	81.50 %	77.70 %		
With presence of children	Count	255	255	227	229	229	192	1387	23.00%	25.00%
	HH%	24.60 %	24.60 %	21.90 %	22.10 %	22.10 %	18.50 %	22.30 %		
Total	Count	1036	1036	1036	1036	1036	1036	6216		
	HH%	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %		

Table 3.12 Households with children for the sample data of Alberta and Census 2006

Children	YEAR	ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
		2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
Without presence of children	Count	380	380	398	402	402	409	2371	77.00%	67.00%
	HH%	74.80 %	74.80 %	78.30 %	79.10 %	79.10 %	80.50 %	77.80 %		
With presence of children	Count	128	128	110	106	106	99	677	23.00%	33.00%
	HH%	25.20 %	25.20 %	21.70 %	20.90 %	20.90 %	19.50 %	22.20 %		
Total	Count	508	508	508	508	508	508	3048		
	HH%	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %		

Source: Statistics Canada, Census 2006 and ACNielsen Homescan™ panel data 2002-2007.

Urban and Rural

The location where households reside is recorded by urban and rural variables in the study sample data. Two dummy variables are created to define the urbanization information of household. The dummy variable (Urban) is created with a value of one if the household reside in an urban area and zero otherwise. On the other hand, the dummy variable (Rural) has a value of one if the household resides in the rural area and zero otherwise.

Table 3.13 Household urbanization for the sample data of Ontario and Census 2006

Urbanization	YEAR	ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
		2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
Rural	Count	334	333	322	323	324	324	1960	19.00%	15.00%
	HH%	32.20%	32.10%	31.10%	31.20%	31.30%	31.30%	31.50%		
Urban	Count	702	703	714	713	712	712	4256	81.00%	85.00%
	HH%	67.80%	67.90%	68.90%	68.80%	68.70%	68.70%	68.50%		

Source: Statistics Canada, Census 2006 and ACNielsen Homescan™ panel data 2002-2007.

Table 3.14 Household urbanization for the sample data of Alberta and Census 2006

		ACNielsen Homescan™ panel data 2002-2007							Census, 2006	
Urbanization	YEAR	2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
Rural	Count	159	160	160	161	160	160	960		
	HH%	31.30%	31.50%	31.50%	31.70%	31.50%	31.50%	31.50%	19.00%	17.00%
Urban	Count	349	348	348	347	348	348	2088		
	HH%	68.70%	68.50%	68.50%	68.30%	68.50%	68.50%	68.50%	81.00%	83.00%

Source: Statistics Canada, Census 2006 and ACNielsen Homescan™ panel data 2002-2007.

In summary, the descriptive statistic results for most of the variables discussed in this section are consistent and relatively close to Canadian Census 2006. The sample is a balanced panel that covers households which stayed in the panel over the study period from 2002 and 2007. So it is observed that households included tend to have older household heads and have a higher education and income level than the whole ACNielsen Homescan™ panel and Canadian census. As a result, behavioural models reported in this study will be more representative for the better educated, more rural and less urban, higher income and older households than for the current population as a whole.

3.5 Summary

In this chapter the methods to be used for the empirical analysis of the study are described. The demand analyses in the study will be conducted using the Working-Leser demand system and LA/AIDS following Heien and Wessells (1990) two step estimation procedure. The application of the two step demand system provides better estimates for panel data which have zero expenditure problems. Detailed demographic data descriptions were presented in this chapter. In the following three chapters, detailed discussions of the three separate demand analysis models, which are the meat choice model, the store choice and brand choice model, are presented.

Chapter 4 Canadian Meat Demand Analysis

4.1 Introduction

The first objective of the study is to understand how Canadian households make purchase decisions around fresh, semi-processed and fully processed meat products for four meat categories: beef, pork, poultry and others (e.g. seafood, mixed meat, etc.). In the analysis the impacts of meat advertising expenditure, demographic and regional characteristic differences on meat purchase behaviour, and differences in the behaviour across meat types will be qualified. In this section, the data setup for the analysis followed by the data descriptive statistics is provided. Then the explanations of model specification and econometric method are given. The model results and summary are finally provided in the final section of the chapter.

4.2 Data Setup and Descriptive Statistics

ACNielsen Homescan™ data is used in this analysis, the data contains all individual panellist's meat purchase information, by size, by product processed form, by branding, and by meat types. The panel has a record of the panellists' household demographic data as well, including age of household head, presence of children, income, education, urban and rural residence information. The value added meat demand analysis in this chapter focuses on the meat products purchased by households in the provinces of Ontario and Alberta over the time period 2002 to 2007. Households that stayed in the panel in all six years of the study period are selected, in total 1036 households in Ontario and 508 households in Alberta are observed in the balanced panel. Meat products are grouped into twelve meat categories according to their "PRTYP" (meat processed type table) and "PRFRM" (meat processed from table) information recorded by ACNielsen Homescan™ data (as discussed in the first chapter). Twelve meat choice alternatives in this analysis

were identified: (1) fresh pork, beef, poultry and others[2]; (2) semi-processed pork, beef, poultry and others; (3) fully processed pork, beef, poultry and others. These product purchases were aggregated into annual expenditure for each household.

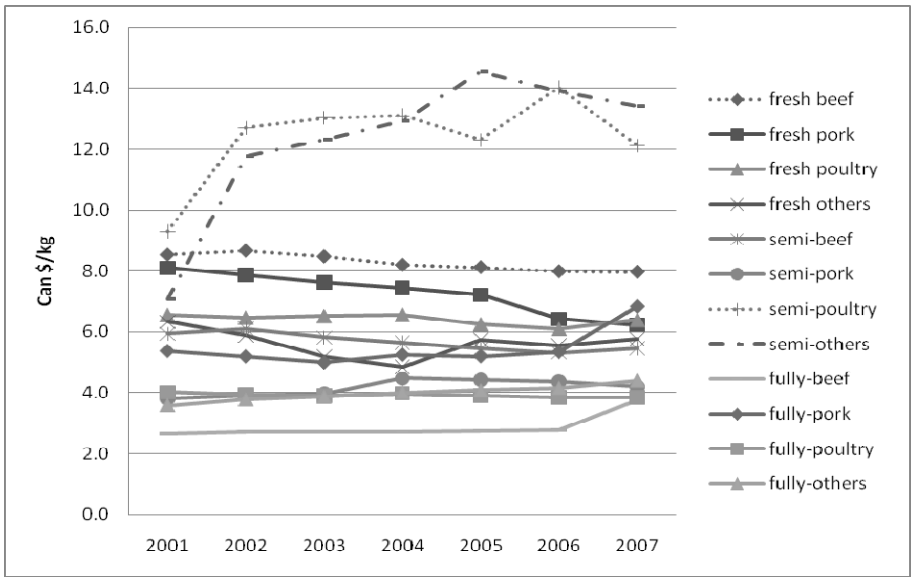
For estimation purposes, meat prices and advertising expenditures by industry are also considered in the analysis although ACNielsen Homescan™ data does not contain these data. The data source, ACNielsen Homescan™ panel, only reports meat expenditure without quantities or prices for most of the random weighted fresh meat products (except for UPC coded products which have quantity information). Thus for price information, proxy meat prices are calculated from ACNielsen MarketTrack™ scanner data. However, the prices gained from ACNielsen MarketTrack™ panel are only regional aggregated annual prices for the twelve meat categories for this study and they only vary by year and region, which results in all households in the same region facing the same prices for each meat category per year. There is no price variability across households within a region and across the same calendar year. Thus the panel data models will not work well due to the small variations in meat prices if all twelve meat prices were used in each equation in the model estimation. Therefore, for estimation purposes, only the "own price" for each meat for each meat is used for the analysis (proxy prices are shown in Table 4.1 and Figures 4.1-4.2). Taking beef price as an example, each household is assumed to face only the beef price when they purchase beef products.

The advertising expenditures, measured in millions of Canadian dollars, were obtained from Nielsen Media Measurement™ advertising data, which contains detailed monthly national advertising data by companies and industry through various channels such as: daily newspaper, magazine, out of home, radio, TV, etc. National advertising expenditures are summed to annual according to twelve meat categories and are used as proxy advertising expenditures for Alberta and Ontario (Table 4.2 and Figures 4.3-4.4). Each household faces same advertising expenditures for each meat category, two kinds of advertising are thus used for each type of meat products: "own

[2] Fresh, semi-processed and fully processed others are mainly seafood and mixed meat products (e.g. beef/pork or chicken/bacon, etc.)

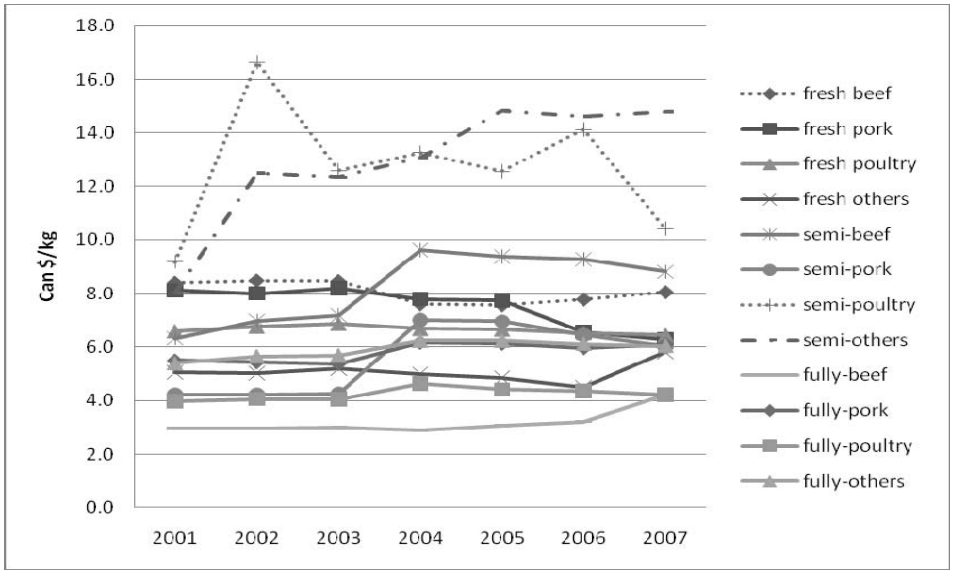
meat advertising" and "all other meat advertising" in order to deal with the issue of small advertising expenditure variation across households.

Figure 4.1 Proxy meat prices (C$) for Ontario model, 2002-2007



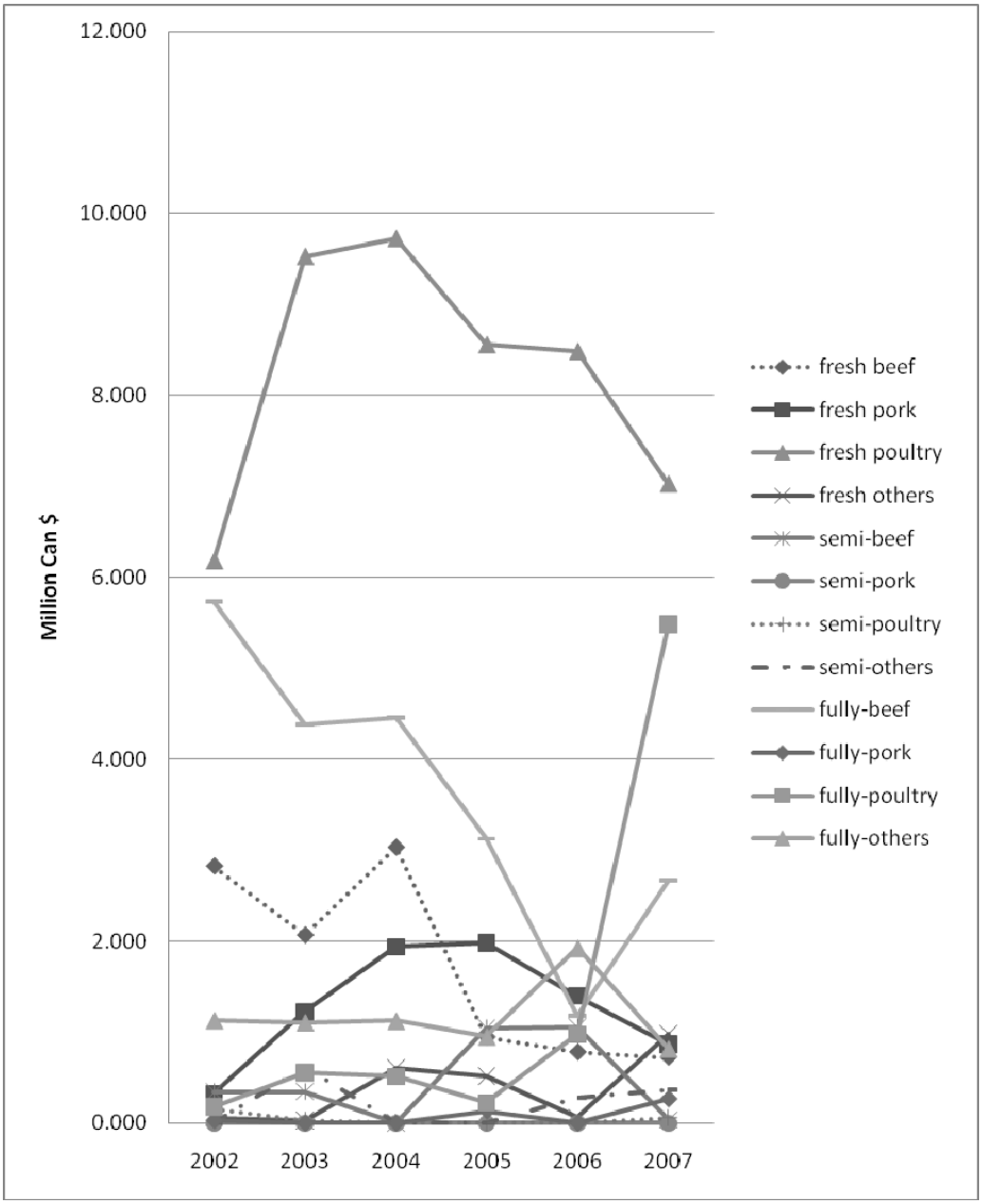
Source: Tabulations from ACNielsen MarketTrack™ scanner data, 2002-2007.

Figure 4.2 Proxy meat prices (C$) for Alberta model, 2002-2007



Source: Tabulations from ACNielsen MarketTrack™ scanner data, 2002-2007.

Figure 4.3 Proxy meat advertising expenditures (Million C$) for Ontario and Alberta models, 2002-2007



Source: Tabulations from Nielsen Media Measurement™ national advertising data, 2002-2007.

Table 4.1 Proxy prices (C$/kg) for each meat product for Ontario and Alberta models 2002-2007

	fresh beef	*fresh pork*	*fresh poultry*	*fresh others*	*semi-beef*	*semi-pork*	*semi-poultry*	*semi-others*	*fully-beef*	*fully-pork*	*fully-poultry*	*fully-others*
Ontario												
2002	8.7	7.9	6.5	5.9	6.1	3.9	12.7	11.8	2.7	5.2	4.0	3.8
2003	8.5	7.6	6.5	5.2	5.8	4.0	13.0	12.3	2.7	5.0	3.9	3.9
2004	8.2	7.5	6.6	4.8	5.6	4.5	13.1	12.9	2.7	5.2	4.0	4.0
2005	8.1	7.2	6.3	5.7	5.5	4.4	12.3	14.5	2.8	5.2	3.9	4.1
2006	8.0	6.4	6.1	5.6	5.3	4.4	14.0	13.9	2.8	5.3	3.9	4.2
2007	8.0	6.2	6.4	5.8	5.5	4.2	12.1	13.4	3.8	6.8	3.8	4.4
Alberta												
2002	8.5	8.0	6.8	5.0	7.0	4.2	16.6	12.5	3.0	5.4	4.1	5.7
2003	8.5	8.2	6.9	5.2	7.2	4.3	12.6	12.3	3.0	5.4	4.0	5.7
2004	7.6	7.8	6.7	5.0	9.6	7.0	13.3	13.1	2.9	6.2	4.6	6.2
2005	7.6	7.7	6.7	4.8	9.4	7.0	12.6	14.8	3.1	6.1	4.4	6.2
2006	7.8	6.6	6.5	4.5	9.3	6.4	14.1	14.6	3.2	6.0	4.4	6.1
2007	8.1	6.3	6.4	5.8	8.8	6.0	10.4	14.8	4.2	6.1	4.2	6.0

Source: Tabulations from ACNielsen MarketTrack™ scanner data, 2002-2007.

Table 4.2 Meat advertising expenditures (Million C$) for Ontario and Alberta models 2002-2007

	fresh beef	*fresh pork*	*fresh poultry*	*fresh others*	*semi-beef*	*semi-pork*	*semi-poultry*	*semi-others*	*fully-beef*	*fully-pork*	*fully-poultry*	*fully-others*
2002	2.822	0.325	6.178	0.059	0.341	0.000	0.152	0.000	5.733	0.028	0.180	1.133
2003	2.063	1.225	9.528	0.032	0.347	0.000	0.026	0.621	4.383	0.000	0.552	1.111
2004	3.029	1.938	9.727	0.608	0.007	0.000	0.000	0.000	4.463	0.000	0.513	1.126
2005	0.943	1.981	8.558	0.518	1.040	0.000	0.000	0.004	3.126	0.135	0.225	0.954
2006	0.779	1.397	8.484	0.062	1.051	0.000	0.000	0.285	1.175	0.001	0.974	1.926
2007	0.722	0.866	7.027	0.977	0.035	0.000	0.060	0.366	2.671	0.264	5.481	0.821

Source: Tabulations from Nielsen Media Measurement™ national advertising data, 2002-2007.

4.2.1 Descriptive Statistics for Total Expenditure on Meat

Aggregate annual expenditures for meat over the period 2002 to 2007 are reported in this section. In Tables 4.3 and 4.4 aggregate market shares for each of the twelve value added meat categories in Ontario and Alberta are reported.

Table 4.3 Market share for each meat category in Ontario 2002-2007

	2002	*2003*	*2004*	*2005*	*2006*	*2007*
Twelve meat categories						
Fresh pork	13%	13%	11%	12%	12%	11%
Fresh beef	32%	30%	30%	28%	29%	29%
Fresh poultry	24%	24%	24%	24%	25%	25%
Fresh others	3%	5%	6%	5%	5%	5%
Semi-processed pork	4%	5%	5%	6%	5%	6%
Semi-processed beef	1%	1%	1%	1%	1%	1%
Semi-processed poultry	1%	2%	2%	2%	2%	2%
Semi-processed others	3%	2%	2%	2%	2%	2%
Fully processed pork	3%	3%	4%	4%	4%	4%
Fully processed beef	1%	1%	1%	1%	1%	0%
Fully processed poultry	8%	8%	7%	6%	6%	6%
Fully processed others	7%	7%	7%	8%	9%	9%
Total	100%	100%	100%	100%	100%	100%
By value added levels						
Fresh meat total	72%	73%	71%	70%	70%	70%
Semi-processed meat total	9%	10%	10%	11%	10%	11%
Fully processed meat total	18%	18%	19%	19%	20%	19%
Total	100%	100%	100%	100%	100%	100%
By meat types						
Pork total	20%	20%	20%	22%	21%	21%
Beef total	33%	31%	31%	30%	31%	31%
Poultry total	34%	34%	34%	33%	33%	33%
Others total	13%	14%	15%	15%	16%	15%
Total	100%	100%	100%	100%	100%	100%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Table 4.4 Market share for each meat category in Alberta 2002-2007

Data	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Twelve meat categories						
Fresh pork	16%	17%	16%	17%	15%	14%
Fresh beef	37%	36%	30%	30%	33%	33%
Fresh poultry	24%	23%	24%	24%	25%	25%
Fresh others	3%	4%	5%	4%	3%	4%
Semi-processed pork	1%	1%	3%	3%	2%	2%
Semi-processed beef	1%	1%	1%	1%	1%	1%
Semi-processed poultry	1%	1%	1%	1%	2%	2%
Semi-processed others	2%	1%	2%	2%	1%	1%
Fully processed pork	4%	4%	5%	5%	5%	5%
Fully processed beef	1%	1%	1%	1%	1%	1%
Fully processed poultry	6%	5%	6%	6%	5%	6%
Fully processed others	5%	5%	8%	7%	7%	8%
Total	100%	100%	100%	100%	100%	100%
By value added levels						
Fresh meat total	80%	80%	75%	75%	76%	75%
Semi-processed meat total	5%	5%	6%	7%	6%	6%
Fully processed meat total	15%	15%	19%	19%	19%	19%
Total	100%	100%	100%	100%	100%	100%
By meat types						
Pork total	21%	23%	24%	25%	22%	21%
Beef total	38%	38%	32%	32%	35%	34%
Poultry total	31%	29%	30%	30%	32%	32%
Others total	10%	11%	14%	13%	12%	12%
Total	100%	100%	100%	100%	100%	100%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007, Alberta.

In Tables 4.5 and 4.6 the average spending per household per year for each meat category from 2002 to 2007 in Alberta and Ontario is reported. Average annual household total expenditures ranged from $267 to $324 in Ontario and $311 to $344 in Alberta. It is interesting to see that the fully processed meat expenditure share has been increasing while the fresh meat category has been decreasing slightly over time.

From Table 4.5, for 2007 on average, household total meat expenditures averaged $307 in Ontario, increasing from $227 in 2002 to $313 in 2007. Beef and poultry have the two largest meat purchasing expenditures. Fresh meat has the largest meat expenditure over time, in which fresh beef has the single largest expenditure.

Table 4.5 Ontario annual average meat expenditure per household (C$) 2002-2007

Data	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Twelve meat categories						
Fresh pork	49.5	52.2	51.6	53.5	51.6	48.1
Fresh beef	101.0	103.4	103.4	106.4	106.2	105.2
Fresh poultry	73.8	82.3	91.1	89.1	87.3	91.0
Fresh others	23.8	28.2	31.9	33.0	31.4	33.3
Semi-processed pork	26.5	26.4	30.6	32.5	28.2	28.3
Semi-processed beef	10.6	12.3	12.7	15.0	17.7	15.5
Semi-processed poultry	17.2	18.4	20.6	21.0	20.5	20.3
Semi-processed others	16.5	15.8	15.2	13.9	15.1	16.9
Fully processed pork	16.5	16.8	22.9	23.5	23.3	22.8
Fully processed beef	13.6	14.4	12.1	11.8	11.5	11.0
Fully processed poultry	38.7	38.3	41.5	38.3	33.4	34.6
Fully processed others	31.2	32.4	34.5	38.1	42.2	37.8
Total	266.6	295.9	321.2	323.6	320.8	313.0
By value added levels						
Fresh meat total	197.6	215.9	235.3	234.0	220.7	223.0
Semi-processed meat total	36.5	38.2	44.8	43.7	40.2	44.4
Fully processed meat total	58.8	62.2	66.9	69.6	70.7	65.3
By meat types						
Pork total	68.0	72.4	80.5	81.5	79.4	79.6
Beef total	104.0	106.0	113.8	111.9	110.7	113.3
Poultry total	97.9	109.9	111.3	113.1	110.9	110.1
Others total	43.3	51.2	56.1	56.7	57.5	55.9

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

As shown in Table 4.6, for 2007, on average, household total meat expenditure averaged $333 in Alberta, which is slightly larger than that in Ontario. Fresh meat purchasing has the largest meat purchasing in Alberta, and fresh beef has the signal largest meat expenditure in the twelve meat categories.

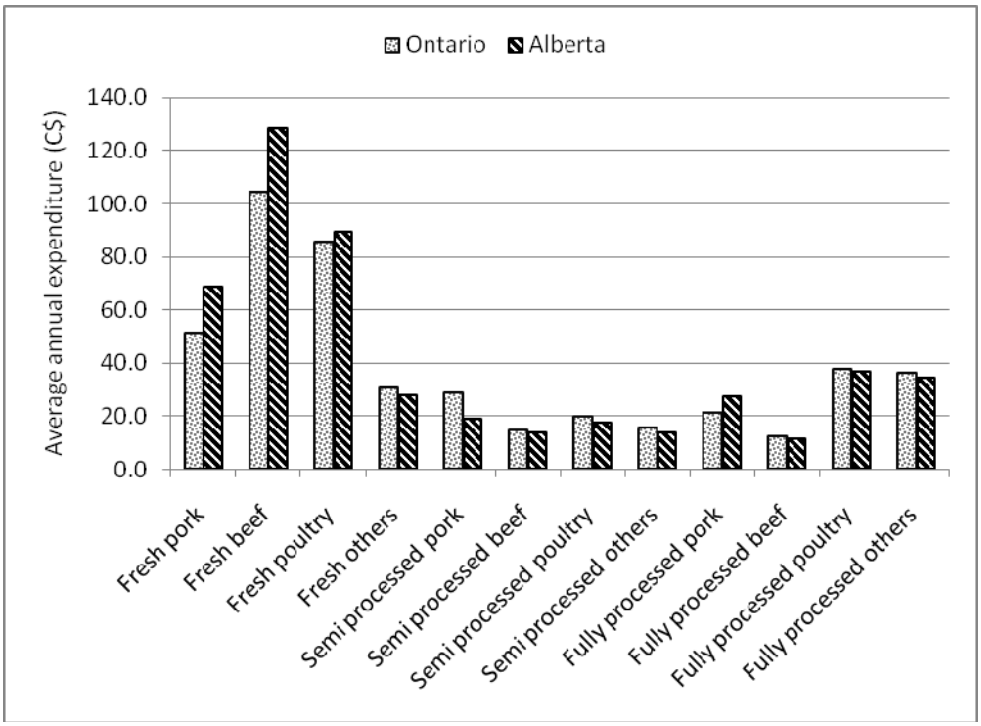
Table 4.6 Alberta annual average meat expenditure per household (C$) 2002-2007

Data	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Twelve meat categories						
Fresh pork	65.4	76.7	71.2	75.6	61.6	61.9
Fresh beef	130.1	141.1	121.6	118.6	128.6	130.0
Fresh poultry	81.9	84.2	93.3	90.9	94.4	91.5
Fresh others	24.0	30.0	34.0	29.2	23.8	24.5
Semi-processed pork	12.8	16.2	23.6	24.9	15.0	17.5
Semi-processed beef	11.3	14.3	14.8	17.1	13.1	11.9
Semi-processed poultry	15.3	14.6	16.4	16.7	19.8	20.1
Semi-processed others	14.3	12.6	14.3	13.5	12.9	13.2
Fully processed pork	23.7	24.2	27.6	28.1	29.1	29.1
Fully processed beef	10.8	11.4	10.4	11.2	13.3	11.1
Fully processed poultry	38.8	32.7	37.7	36.3	34.8	39.3
Fully processed others	26.7	30.4	38.3	39.4	34.6	35.3
Total	311.1	334.6	344.4	335.3	343.6	330.2
By value added levels						
Fresh meat total	250.6	273.6	270.9	256.7	242.2	259.3
Semi-processed meat total	23.2	25.1	29.0	32.6	25.6	27.4
Fully processed meat total	55.9	57.9	74.1	74.3	67.9	70.0
By meat types						
Pork total	76.8	83.9	96.1	98.0	81.1	81.9
Beef total	137.9	149.5	124.1	121.6	132.5	127.2
Poultry total	104.0	104.9	109.7	109.5	111.9	116.2
Others total	37.2	43.3	56.5	53.6	47.4	47.7

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.4 shows the comparision of average annual meat expenditures per household in Ontario and Alberta from 2002 to 2007. It is noticeable that households in Alberta have higher expenditures on fresh pork, beef and poultry products than those in Ontario. For semi-processed and fully processed meat categories, both regions show the similar expenditures of processed meat products.

Figure 4.4 Ontario and Alberta average annual meat expenditures (C$) per household

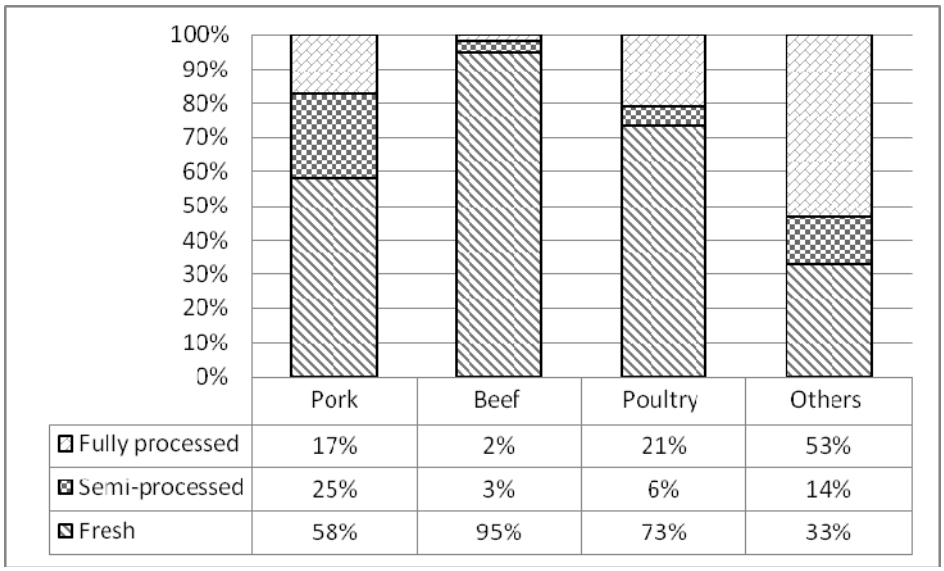


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

4.2.2 Levels of Meat Processing

In Figures 4.5 and 4.6 the level of processing for meat products is presented. It can be seen that the level of processing varies across meat types in both regions. The same trend as found by Ward (1997) shows that there are fewer processed beef products in the market, 95 percent of beef products are sold in fresh forms in both regions. Over 50 percent of the other meats (mostly seafood) are sold in fully processed forms in both regions, and a relatively high percentage of pork products are sold in semi-/fully processed forms in the markets in Alberta and Ontario.

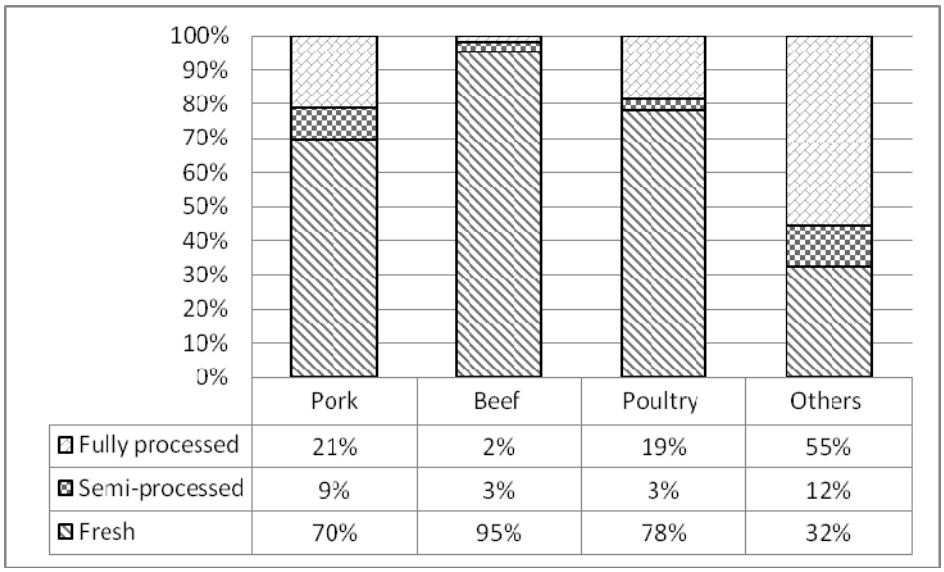
Figure 4.5 Processing level by meat type in Ontario 2002-2007



	Pork	Beef	Poultry	Others
Fully processed	17%	2%	21%	53%
Semi-processed	25%	3%	6%	14%
Fresh	58%	95%	73%	33%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.6 Processing level by meat type in Alberta 2002-2007



	Pork	Beef	Poultry	Others
Fully processed	21%	2%	19%	55%
Semi-processed	9%	3%	3%	12%
Fresh	70%	95%	78%	32%

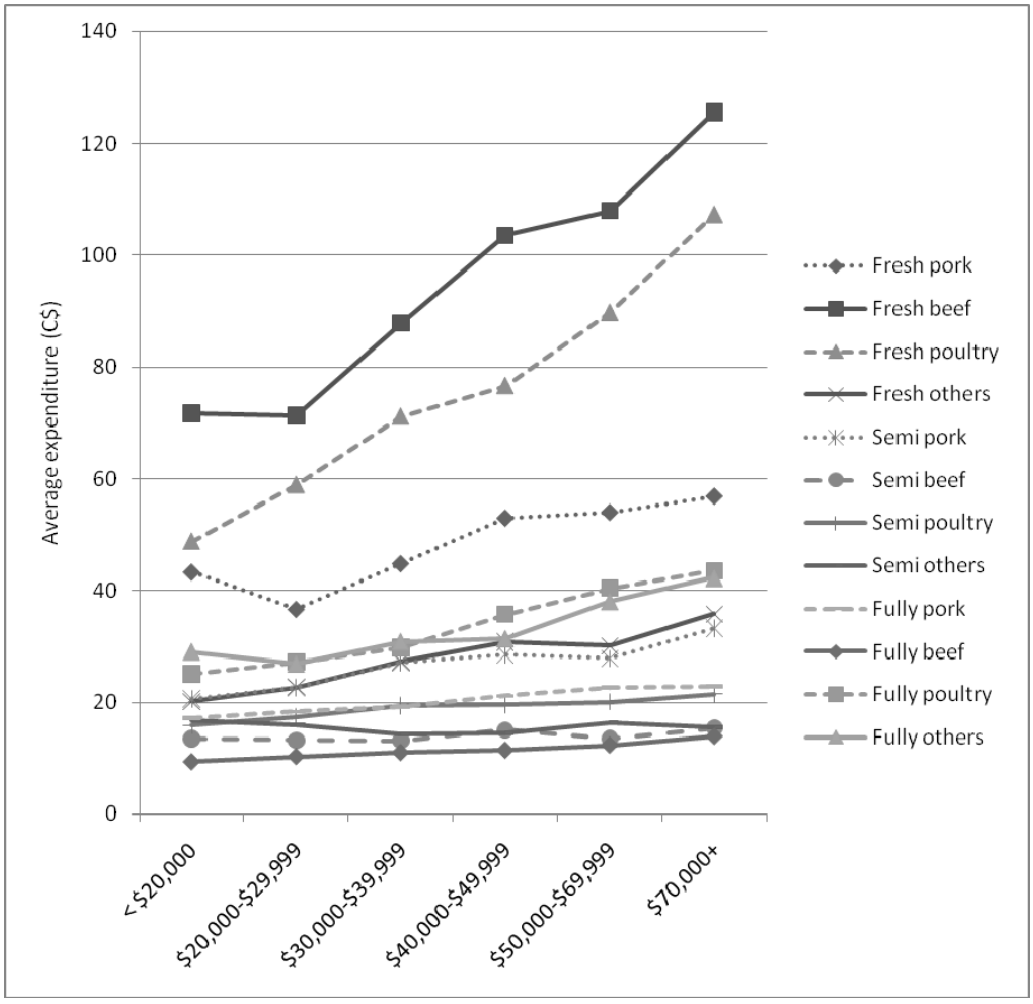
Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

4.2.3 Household Meat Expenditure Patterns, Levels

Consumers usually have heterogeneous preferences, so it is useful to segment consumers into groups with similar needs and background. Segmentation variables used in the study are the household demographic variables. The relationship between meat expenditure patterns and household demographics is shown in the following figures and tables.

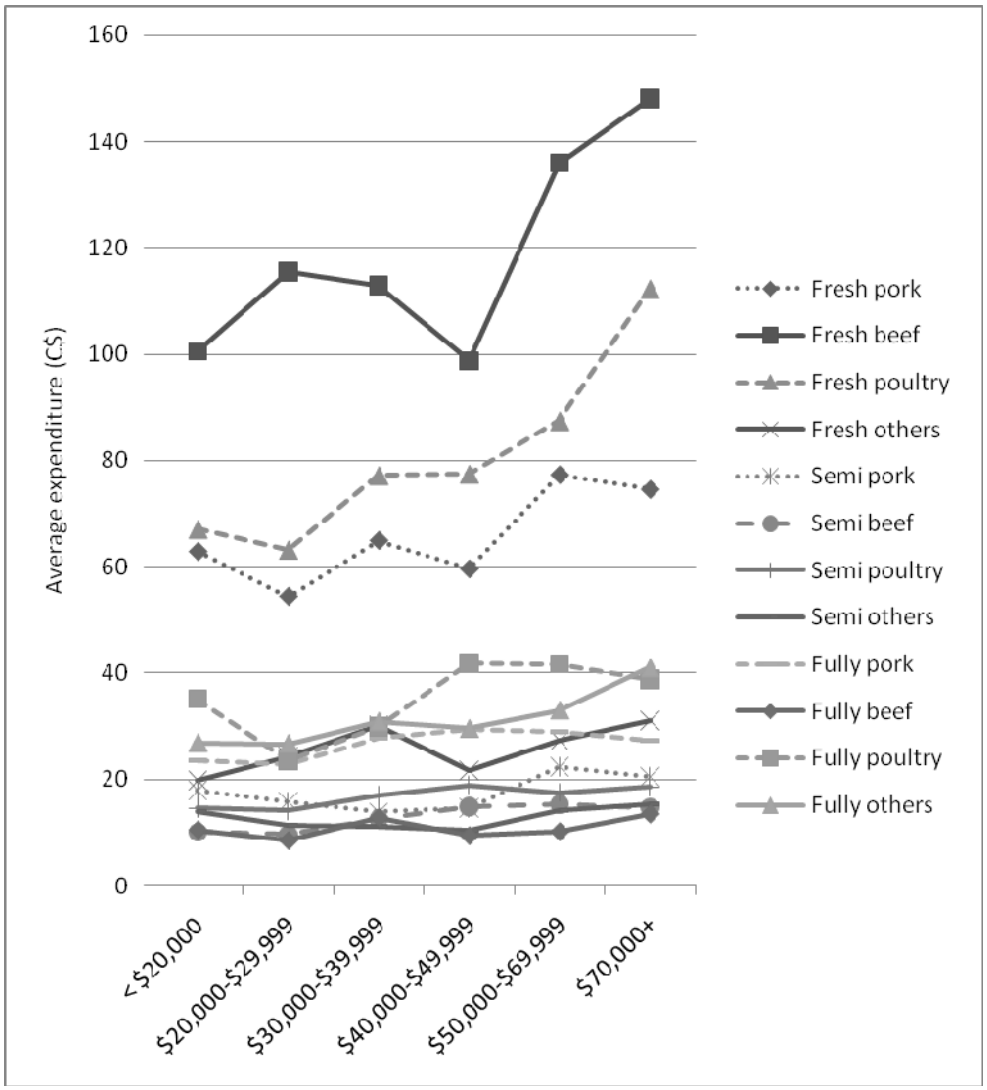
Household income:

Figure 4.7 Household incomes and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.8 Household incomes and average annual meat expenditures (C$) in Alberta



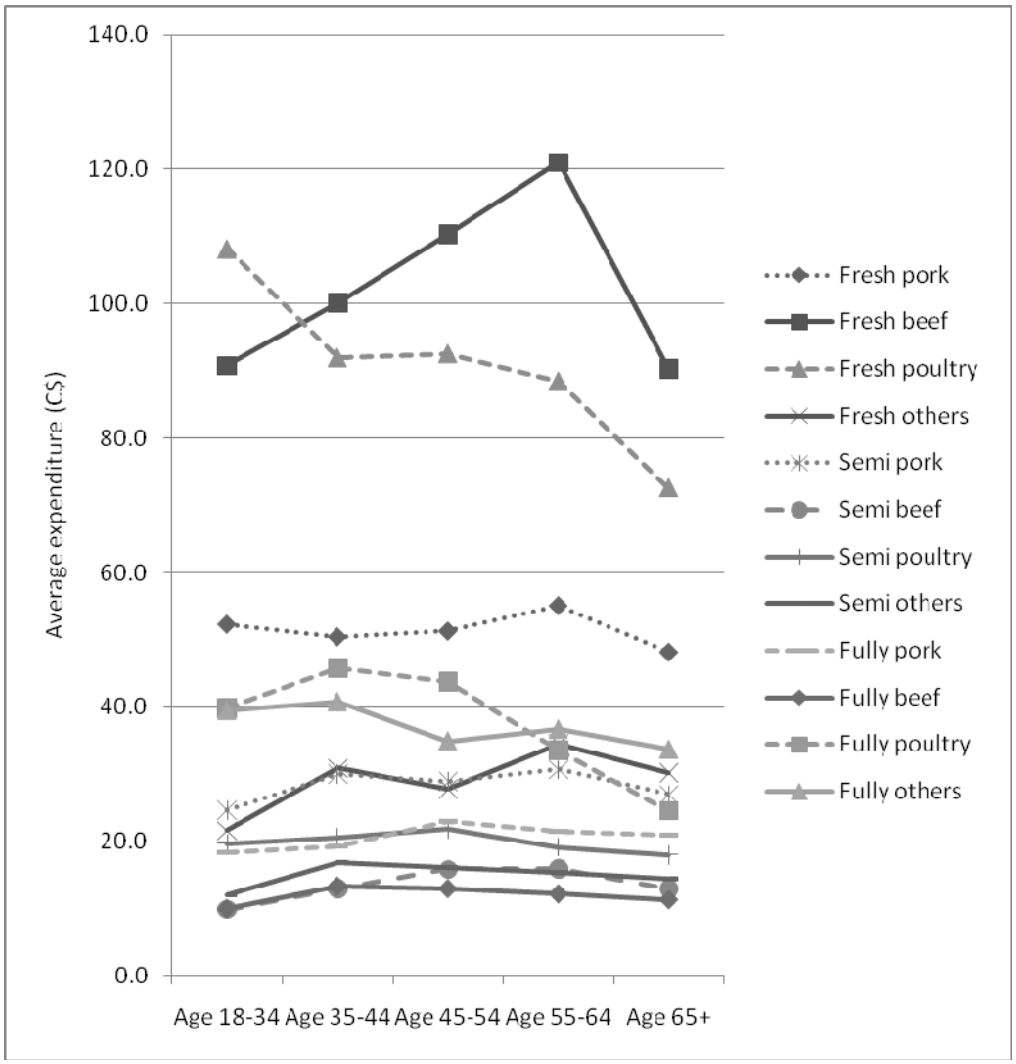
Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

It is noticeable that as household incomes increase, higher consumption of fresh beef and fresh poultry products in Ontario and in Alberta occur. The relationship between income levels and the twelve meat products' consumption vary somewhat across both regions.

Household age

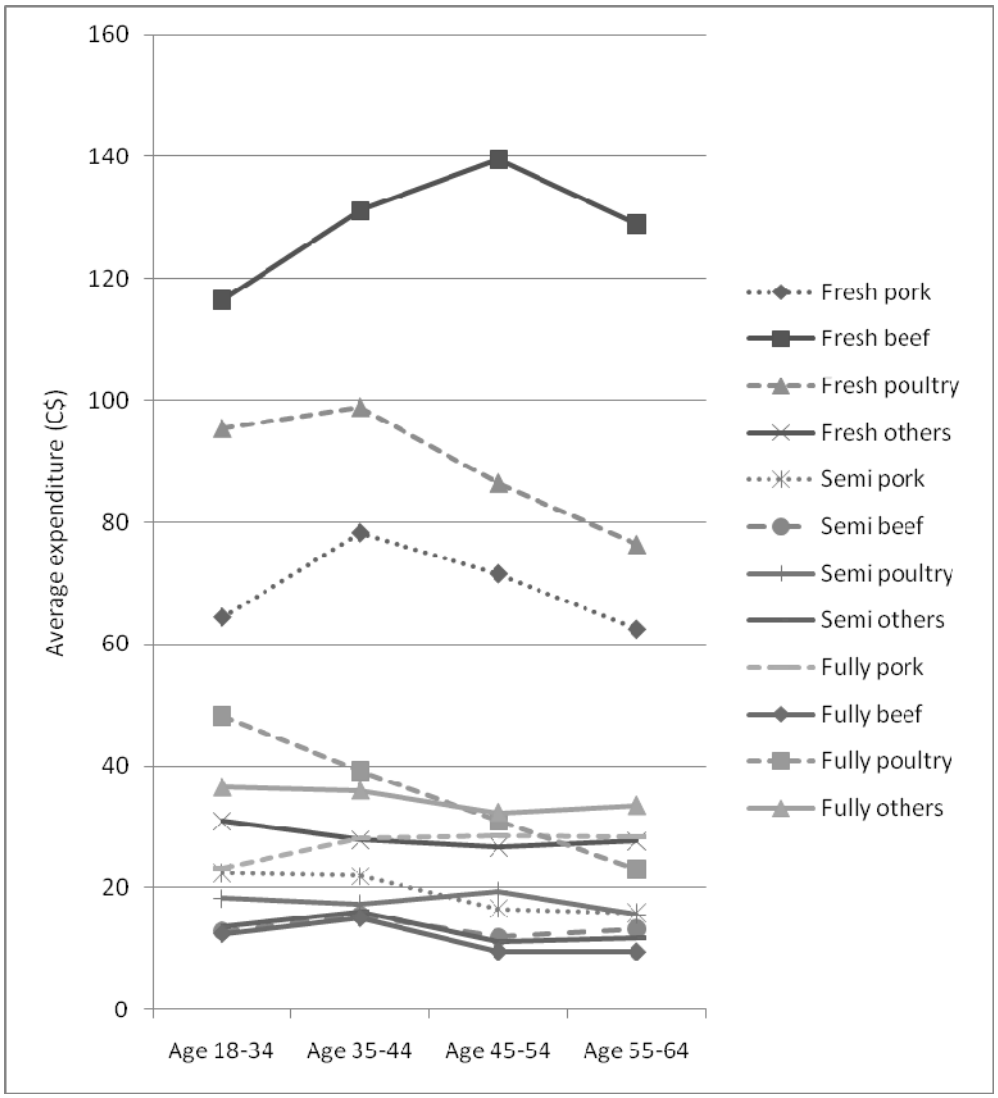
From Figures 4.9 and 4.10, it can be observed that in Ontario average fresh poultry product consumption is decreasing as household age increases. In Alberta, older households (except for the over 65 age category) have a higher average consumption of fresh beef products, and the average fresh and fully processed poultry product consumption is decreasing as household age increases.

Figure 4.9 Household age and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.10 Household age and average annual meat expenditures (C$) in Alberta

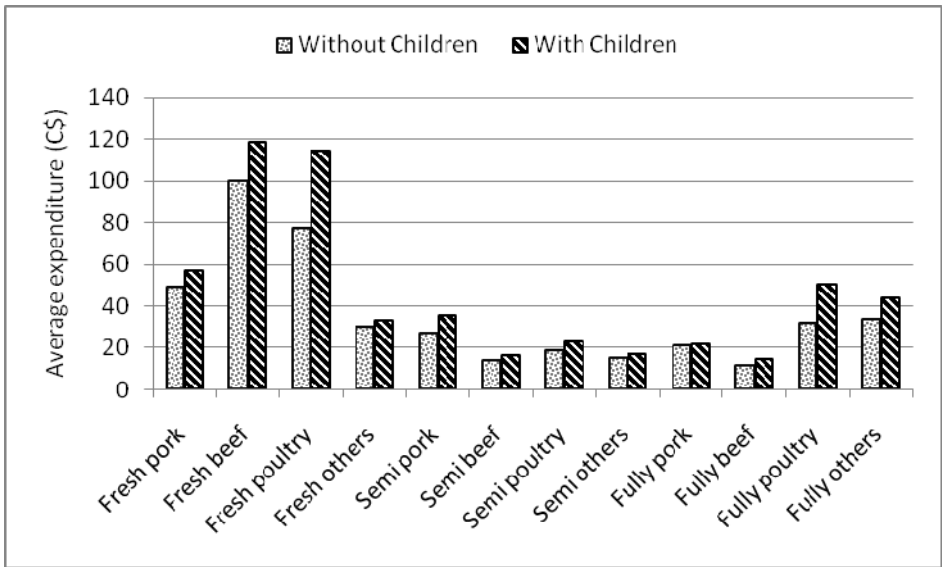


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Presence of Children

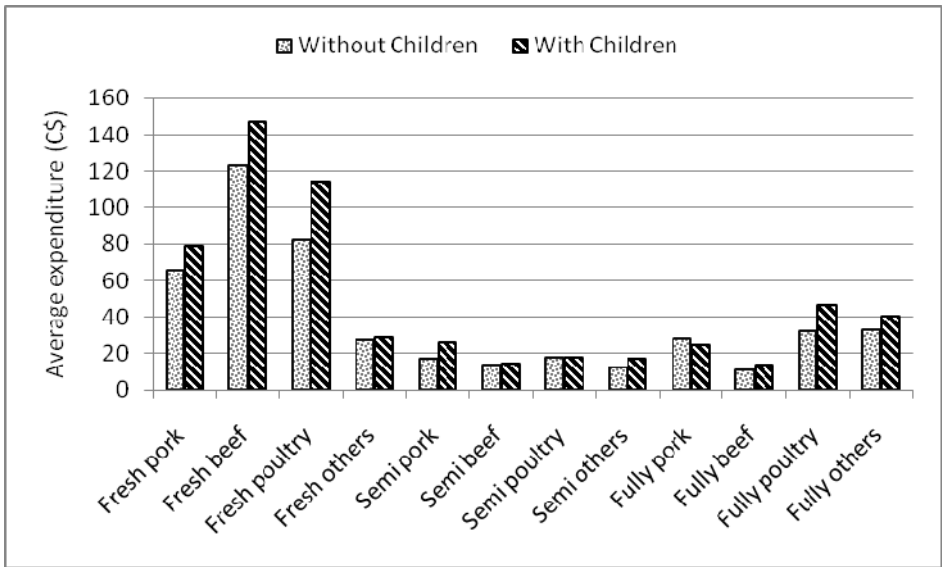
Figures 4.11 and 4.12 show the households in aggregate with the presence of children are spending more on each meat product in both regions.

Figure 4.11 Households with children and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.12 Households with children and average annual meat expenditures (C$) in Alberta

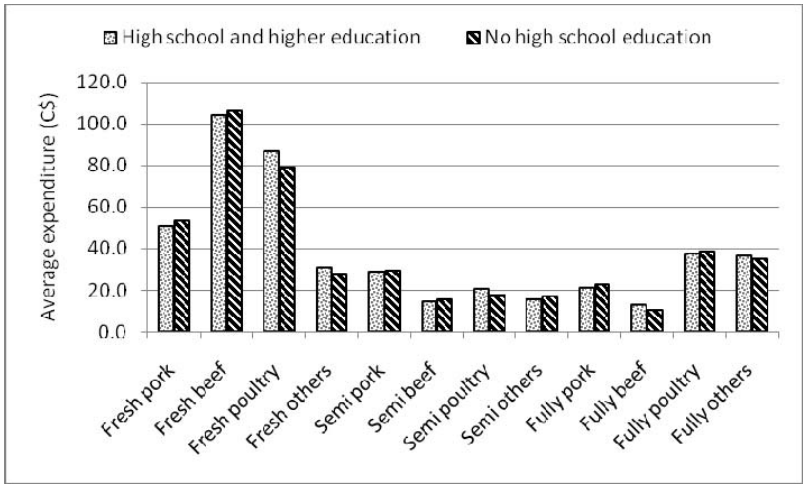


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Education

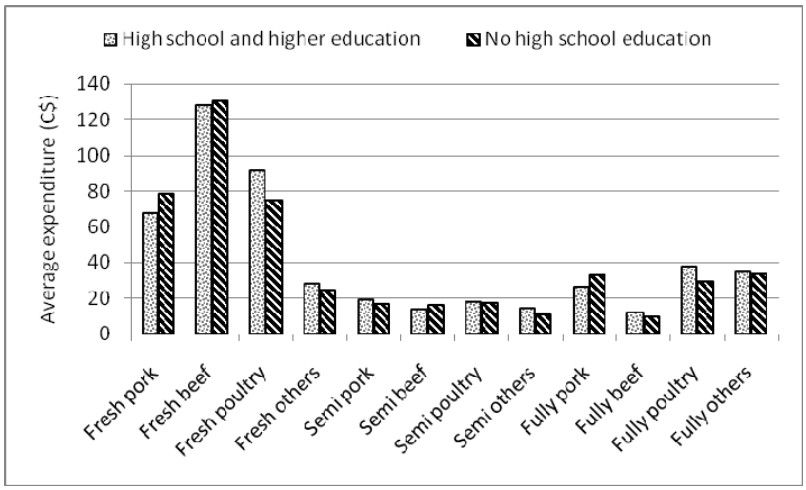
The education levels of the household head education are observed to have little relationship with semi-processed beef and poultry consumption in Ontario and semi-processed meat products in Alberta.

Figure 4.13 Household head education and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.14 Household head education and average annual meat expenditures (C$) in Alberta

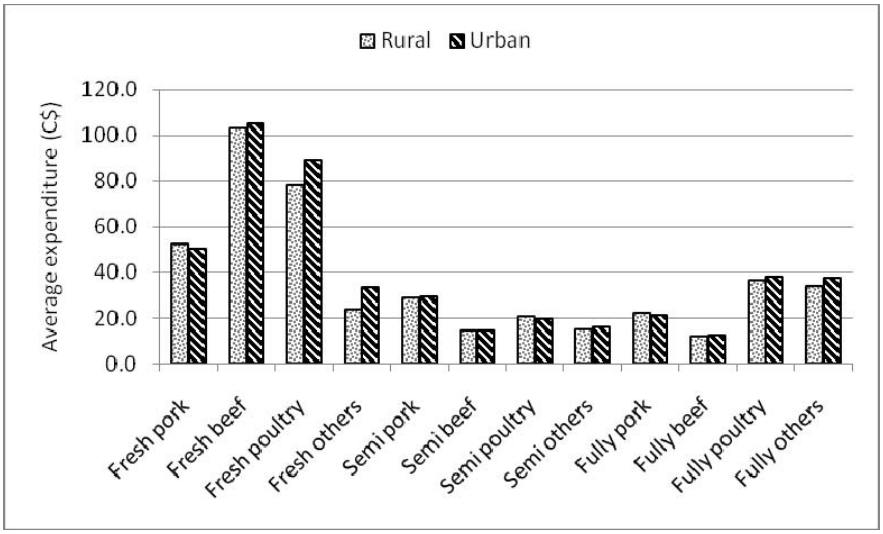


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Urban and Rural

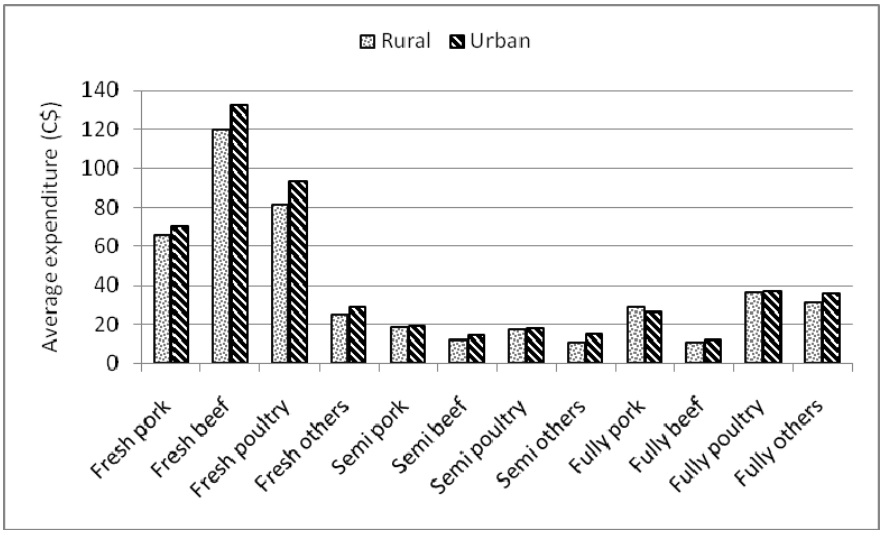
Urban dwellers in Ontario have higher fresh poultry and other meats spending and urban dwellers in Alberta are spending more on fresh poultry, fresh beef and other meat products.

Figure 4.15 Households residing in urban area and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.16 Households residing in urban area and average annual meat expenditures (C$) in Alberta

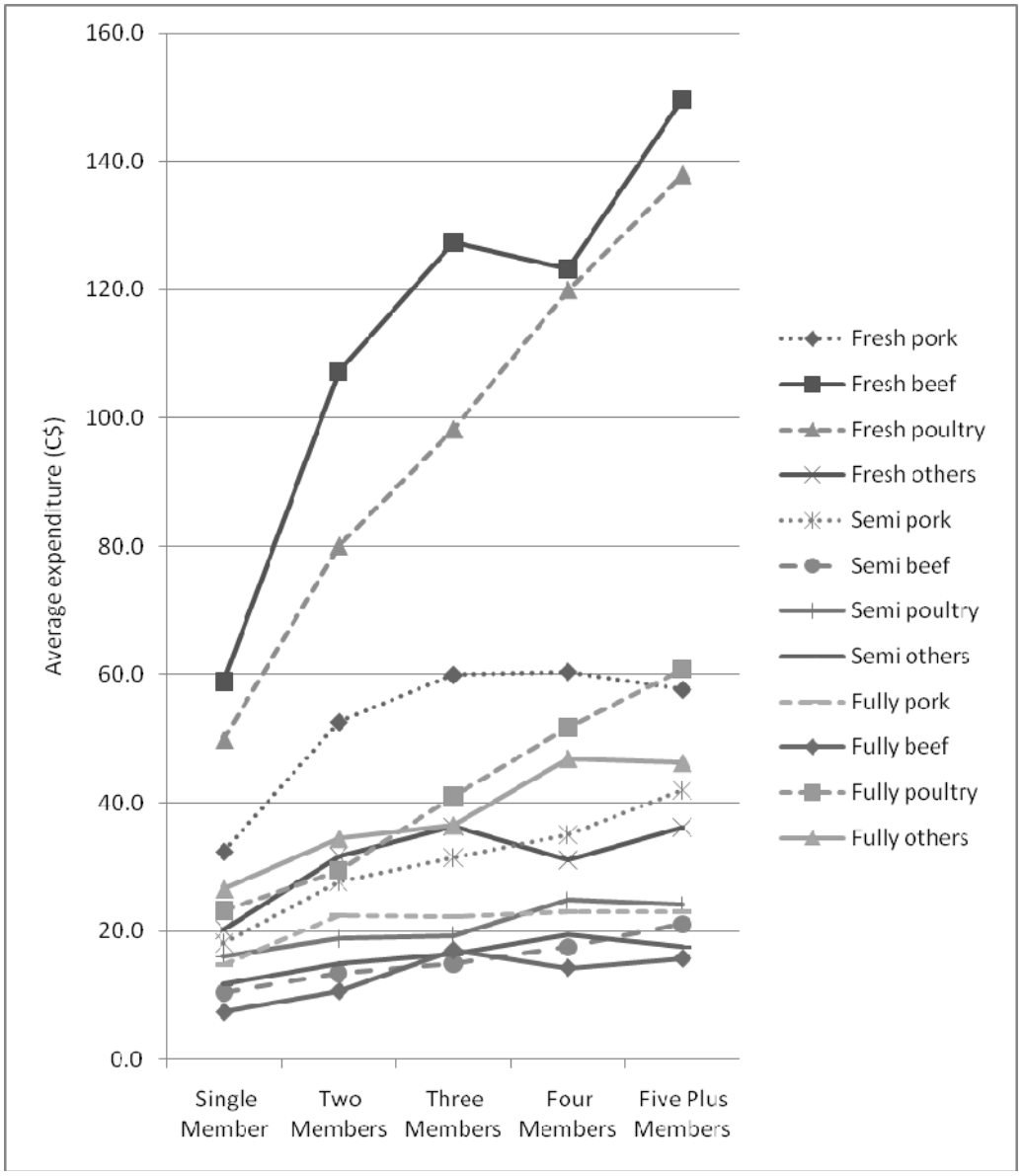


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Household size

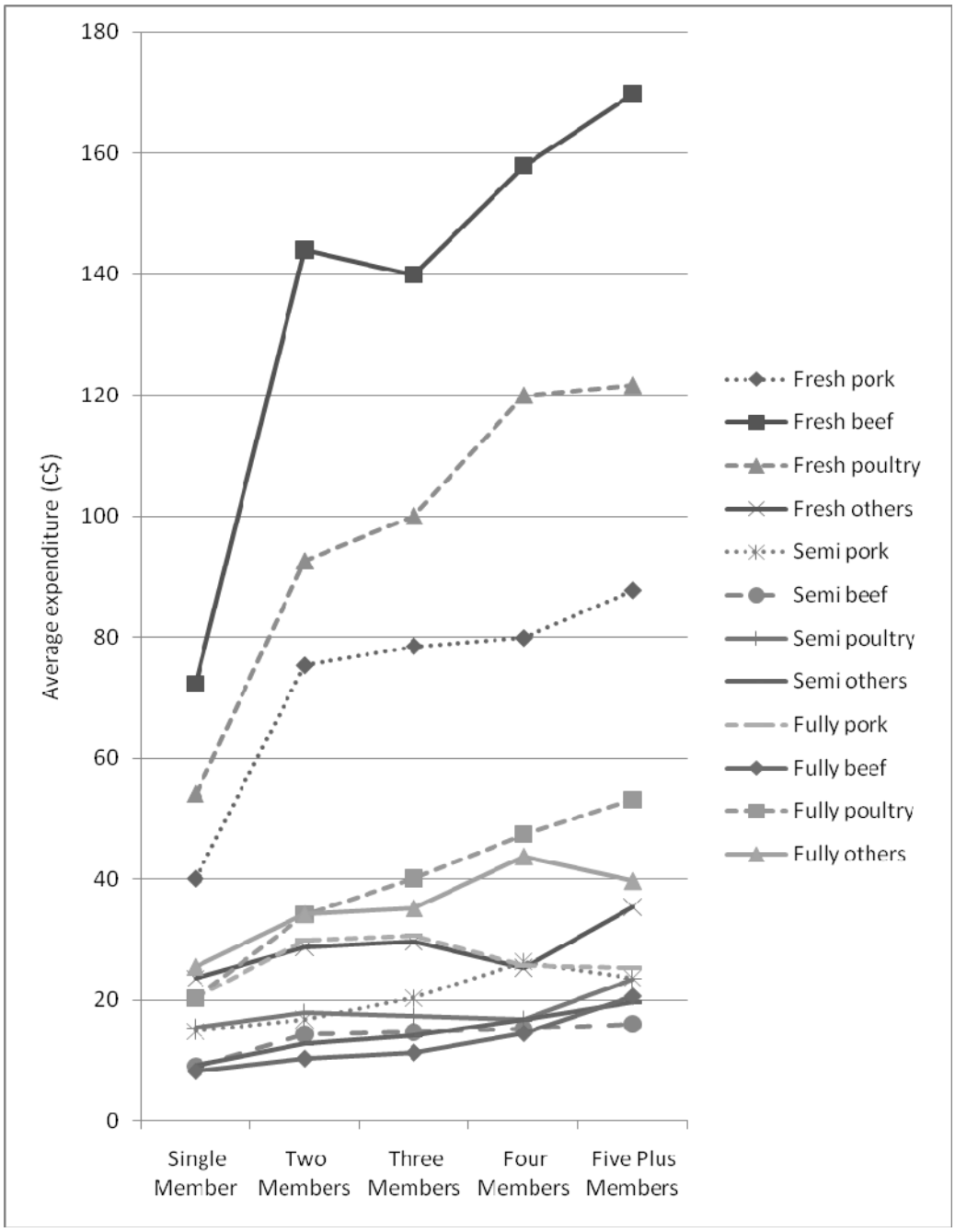
In Ontario, the expenditure on fresh pork and fresh beef products do not increase much as household sizes increase. It is noticeable that household size has little relationship with semi-processed meat purchasing in Ontario and Alberta.

Figure 4.17 Household size and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 4.18 Household size and average annual meat expenditures (C$) in Alberta



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Table 4.7 Average meat expenditure (C$) and households with different demographic information in Ontario 2002-2007

Demographics	***Fresh pork***	***Fresh beef***	***Fresh poultry***	***Fresh others***	***Semi pork***	***Semi beef***	***Semi poultry***	***Semi others***	***Fully pork***	***Fully beef***	***Fully poultry***	***Fully others***
Household income($)												
10000	43	72	49	20	21	14	16	17	17	9	25	29
24999.5	37	71	59	23	23	13	17	16	18	10	27	27
34999.5	45	88	71	27	27	13	19	14	19	11	30	31
44999.5	53	104	77	31	29	15	20	15	21	11	36	31
59999.5	54	108	90	30	28	14	20	16	23	12	40	38
74999.5	57	126	107	36	33	15	22	16	23	14	44	42
Household age												
26	52	91	108	22	25	10	20	12	18	10	40	40
39.5	50	100	92	31	30	13	21	17	19	13	46	41
49.5	51	110	93	28	29	16	22	16	23	13	44	35
59.5	55	121	89	35	31	16	19	15	22	12	34	37
69.5	48	90	73	30	27	13	18	15	21	11	25	34
Children												
Without Children	49	100	77	30	27	14	19	15	21	11	32	34
With Children	57	119	114	33	35	16	23	17	22	15	51	44
Education												
High school & higher	51	104	87	31	29	14	20	15	21	13	37	37
No high school	53	106	79	28	29	15	18	17	23	10	39	35
Residing in												
Rural	52	103	78	24	29	14	20	15	22	12	36	34
Urban	51	105	89	33	29	14	20	16	21	13	38	37
Household size												
Single Member	32	59	50	20	18	11	16	12	15	7	23	27
Two Members	53	107	80	32	28	13	19	15	23	11	29	34
Three Members	60	127	98	36	32	15	19	16	22	17	41	37
Four Members	60	123	120	31	35	18	25	19	23	14	52	47
Over Five	58	150	138	36	42	21	24	18	23	16	61	46

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Table 4.8 Average meat expenditure (C$) and households with different demographic information in Alberta 2002-2007

Demographics	*Fresh pork*	*Fresh beef*	*Fresh poultry*	*Fresh others*	*Semi pork*	*Semi beef*	*Semi poultry*	*Semi others*	*Fully pork*	*Fully beef*	*Fully poultry*	*Fully others*
Household income($)												
10000	63	101	67	20	18	10	15	14	23	11	35	27
24999.5	54	116	63	24	16	10	14	11	23	9	24	27
34999.5	65	113	77	30	14	12	17	11	28	13	30	31
44999.5	60	99	77	22	15	15	19	10	29	9	42	30
59999.5	77	136	87	27	22	15	18	14	29	10	42	33
74999.5	75	148	112	31	21	15	19	15	27	14	39	41
Household age												
26	47	100	85	18	14	14	17	13	21	8	42	27
39.5	64	117	95	31	22	13	18	14	23	12	48	37
49.5	78	131	99	28	22	16	17	16	28	15	39	36
59.5	71	140	86	27	17	12	19	11	29	10	31	32
69.5	62	129	76	28	16	13	16	12	28	9	23	34
Children												
Without Children	66	123	82	27	17	14	18	12	28	11	32	32
With Children	79	147	114	29	26	14	17	17	25	14	47	40
Education												
High school & higher	67	128	92	28	19	13	18	14	26	12	38	34
No high school	78	130	75	25	16	16	17	10	33	10	29	33
Residing in												
Rural	66	119	81	25	18	12	17	11	28	11	36	31
Urban	70	132	93	29	19	14	18	15	26	12	37	36
Household size												
Single Member	40	72	54	24	15	9	15	9	20	8	20	26
Two	75	144	93	29	17	14	18	13	30	10	34	34
Three	78	140	100	30	20	15	17	14	31	11	40	35
Four	80	158	120	25	26	15	17	17	26	14	47	44
Over Five	88	170	122	35	24	16	23	20	25	21	53	40

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Tables 4.7 and 4.8 report the average meat expenditure (Can $) and households with different demographic information in Ontario and Alberta over the period 2002 to 2007, identifying the similarities and differences in the impact of socioeconomic and household demographics on household meat purchase behaviour. In summary, the common finding in the first meat choice analysis is that there are significant demographic differences in household purchases of meat products across provinces.

4.2.4 Sample Data Statistics

Sample statistics and variable definitions are shown in Table 4.9 for both Alberta and Ontario. For the first Probit model, the binary dependent variable (B11, B12, B13, B14, B21, B22, B23, B24, B31, B32, B33, B34) is one if its meat category was purchased by a household and zero otherwise. For the second Working-Leser demand system, each meat type expenditure share is used as the dependent variable (SH11, SH12, SH13, SH14, SH21, SH22, SH23, SH24, SH31, SH32, SH33, SH34). For Ontario, average meat expenditure shares for (1) fresh pork, beef, poultry and others; (2) semi-processed pork, beef, poultry and others; (3) fully processed pork, beef, poultry and others are 0.11, 0.27, 0.25, 0.05, 0.05, 0.01, 0.03, 0.02, 0.04, 0.01, 0.08, 0.10, respectively. For Alberta, average meat expenditure shares in the same order are 0.14, 0.28, 0.25, 0.04, 0.02, 0.01, 0.01, 0.02, 0.06, 0.01, 0.07, and 0.09, respectively. Household demographic information and proxy meat prices and advertising expenditures are also presented in the table.

Table 4.9 Definition and sample statistics of variables used for value added meat choice analysis

Variables	*Definitions*	*Ontario*		*Alberta*	
First stage: binary dependent variables		***Mean***	***SD***	***Mean***	***SD***
B11	1 if choose fresh pork, 0 otherwise	0.78	0.42	0.81	0.39
B12	1 if choose fresh beef, 0 otherwise	0.91	0.29	0.89	0.31
B13	1 if choose fresh poultry, 0 otherwise	0.93	0.26	0.93	0.26
B14	1 if choose fresh others, 0 otherwise	0.53	0.50	0.51	0.50
B21	1 if choose semi-processed pork, 0 otherwise	0.60	0.49	0.41	0.49
B22	1 if choose semi-processed beef, 0 otherwise	0.24	0.43	0.27	0.44
B23	1 if choose semi-processed poultry, 0 otherwise	0.35	0.48	0.23	0.42
B24	1 if choose semi-processed others, 0 otherwise	0.45	0.50	0.41	0.49
B31	1 if choose fully-processed pork, 0 otherwise	0.57	0.49	0.65	0.48
B32	1 if choose fully-processed beef, 0 otherwise	0.17	0.38	0.23	0.42
B33	1 if choose fully-processed poultry, 0 otherwise	0.60	0.49	0.57	0.50
B34	1 if choose fully-processed others, 0 otherwise	0.72	0.45	0.70	0.46
Second stage: expenditure share dependent variables					
SH11	share of fresh pork expenditure	0.11	0.11	0.14	0.13
SH12	share of fresh beef expenditure	0.27	0.19	0.28	0.19
SH13	share of fresh poultry expenditure	0.25	0.18	0.25	0.17
SH14	share of fresh others expenditure	0.05	0.10	0.04	0.08
SH21	share of semi-processed pork expenditure	0.05	0.07	0.02	0.05
SH22	share of semi-processed beef expenditure	0.01	0.03	0.01	0.02
SH23	share of semi-processed poultry expenditure	0.03	0.07	0.01	0.04
SH24	share of semi-processed others expenditure	0.02	0.05	0.02	0.05
SH31	share of fully processed pork expenditure	0.04	0.07	0.06	0.09
SH32	share of fully processed beef expenditure	0.01	0.02	0.01	0.02
SH33	share of fully processed poultry expenditure	0.08	0.12	0.07	0.12
SH34	share of fully processed others expenditure	0.10	0.14	0.09	0.14
Logged form of meat expenditure					
LM11	logged fresh pork expenditure	1.21	0.77	1.36	0.79
LM12	logged fresh beef expenditure	1.67	0.73	1.73	0.79
LM13	logged fresh poultry expenditure	1.66	0.66	1.71	0.64
LM14	logged fresh others expenditure	0.68	0.73	0.65	0.72
LM21	logged semi-processed pork expenditure	0.78	0.72	0.45	0.61
LM22	logged semi-processed beef expenditure	0.24	0.47	0.27	0.48
LM23	logged semi-processed poultry expenditure	0.40	0.60	0.26	0.51
LM24	logged semi-processed others expenditure	0.47	0.59	0.41	0.55
LM31	logged fully processed pork expenditure	0.69	0.67	0.85	0.71
LM32	logged fully processed beef expenditure	0.16	0.39	0.20	0.43
LM33	logged fully processed poultry expenditure	0.83	0.78	0.79	0.77
LM34	logged fully processed others expenditure	1.01	0.74	0.98	0.73

Table 4.9 continued...

Variables	*Definitions*	*Ontario*		*Alberta*	
HH demographic and purchase information		**Mean**	**SD**	**Mean**	**SD**
MTotal	Total expenditure on all meat (Can $)	385.3	325.4	414.8	337.7
LTE	logged total exp on all types of meat	2.42	0.42	2.46	0.41
HHINC	Annual HH income (10K C$, midpoint)	5.24	2.22	5.19	2.19
HAGE	Household head age (midpoint)	55.42	11.88	53.45	12.22
KID1	1 if HH with children, 0 otherwise	0.22	0.42	0.22	0.42
KID0	1 if HH without children , 0 otherwise	0.78	0.42	0.78	0.42
HHEDU0	1 if no high school edu, 0 otherwise	0.14	0.35	0.13	0.34
HHEDU1	1 if higher edu, 0 otherwise	0.86	0.35	0.87	0.34
URBAN	1 if in urban area, 0 otherwise	0.68	0.46	0.69	0.46
RURAL	1 if in rural area, 0 otherwise	0.32	0.46	0.31	0.46
HHSIZE	Number of members in household	2.40	1.21	2.34	1.21
Chains	Number of grocery chains HH visited	2.60	0.89	2.84	1.17
Variables	*Definitions*	*Ontario & Alberta*			
Advertising expenditure by meat types (in a million C$)		**Mean**		**SD**	
AD11	fresh pork AD	1.72		0.96	
AD12	fresh beef AD	1.29		0.58	
AD13	fresh poultry AD	8.25		1.28	
AD14	fresh others AD	0.38		0.35	
AD21	semi-processed pork AD	0.47		0.43	
AD22	semi-processed beef AD	0		0	
AD23	semi-processed poultry AD	0.04		0.05	
AD24	semi-processed others AD	0.21		0.23	
AD31	fully-processed pork AD	3.59		1.47	
AD32	fully-processed beef AD	0.07		0.10	
AD33	fully-processed poultry AD	1.32		1.88	
AD34	fully-processed others AD	1.17		0.35	
AD11oth	Total AD except for fresh pork	16.79		1.63	
AD12oth	Total AD except for fresh beef	17.23		1.74	
AD13oth	Total AD except for fresh poultry	10.00		1.58	
AD14oth	Total AD except for fresh others	18.14		1.70	
AD21oth	Total AD except for semi-processed pork	18.05		2.18	
AD22oth	Total AD except for semi-processed beef	18.52		1.83	
AD23oth	Total AD except for semi-processed poultry	18.48		1.84	
AD24oth	Total AD except for semi-processed others	18.31		1.80	
AD31oth	Total AD except for fully-processed pork	14.93		1.88	
AD32oth	Total AD except for fully-processed beef	18.45		1.82	
AD33oth	Total AD except for fully-processed poultry	17.20		2.38	
AD34oth	Total AD except for fully-processed others	17.34		2.03	

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007 and Nielsen Media Measurement™ national advertising data, 2002-2007.

4.3 Model Structure and Model Specification

In this study a balanced panel of sample data in Ontario and Alberta is analyzed. Not all households have positive expenditures on all twelve meat categories (namely fresh, semi-processed and fully processed products for four meat type categories: beef, pork, poultry and others). The positive meat expenditures show that households have already made the decision to purchase and are able to choose one or more products from the twelve meat categories. Each household is assumed to face a two-step hierarchy in their decision making: the household first makes the decision of what types of meat to purchase (participation step), then they will decide how much they will spend on the meat products (expenditure step).

Therefore a two-step estimation procedure following the Heien and Wessels (1990) Working-Leser demand system procedure is applied in the meat demand analysis. In the first step, a probit regression is computed to determine the probability that a given household will purchase a particular meat product. The probability of the purchase is then used as an instrument in the second-stage estimation of the Working-Leser demand system.

(1) Participation decision by meat products

The first stage of the demand system is modeled as a participation choice problem: the dependent variable is represented by a binary choice variable $y_{iht} = 1$ if household *h* decides to purchase a meat *i* at period *t* and is $y_{iht} = 0$ if the household does not consume the meat product *i* at period *t*. Then $E(y_{iht}) = 1 * p_{iht} + 0 * (1 - p_{iht}) = p_{iht}$ and this is usually modeled as a function of household demographic variables, total meat expenditure and meat advertising expenditure. The inverse mills ratio is actually the expectation of the structural residual, where the model is given by (TSP 5.0 reference manual, page 354):

$$y_i = X_i\beta + \varepsilon_i \quad \varepsilon_i \sim \mathrm{N}(0,1), \quad D_i = 1(y_i > 0).$$

The inverse mills ratio is the value of the following two expressions, depending on whether D=0 or 1 (TSP 5.0 reference manual, page 355):

$$E(D=1)=\frac{Norm(-Xb)}{1-Cnorm(-Xb)}=\frac{Norm(Xb)}{Cnorm(Xb)}=Dlcnorm(Xb)$$

$$E(D=0)=\frac{Norm(-Xb)}{Cnorm(-Xb)}=-Dlcnorm(-Xb)\,,$$

where Norm is the normal density, Cnorm is the cumulative normal and Dlcnorm is the derivative of the log cumulative normal with respect to its argument.

So the likelihood of household participation decision by meat type ($\Pr[y_{iht}=1]$) can be expressed as:

$$\Pr[y_{iht}=1]=\Pr[X_{iht}^{t}\beta+a_{iht}+\varepsilon_{ih}>0]=\phi(X_{iht}^{t}\beta)$$

and the likelihood that households do not purchase a particular meat is:

$$\Pr[y_{iht}=0]=\Pr[X_{iht}^{t}\beta+a_{iht}+\varepsilon_{ih}=0]=1-\phi(X_{iht}^{t}\beta)\,.$$

where

$$X_{iht}^{t}\beta=\beta_0+\beta_1*\mathrm{MTotal}+\beta_2*hage+\beta_3*hhedu1+\beta_4*urban+\beta_5*hhsize$$
$$+\beta_6*T+\beta_7 AD+\beta_8 ADoth+\beta_9*HHINC+\beta_{10}*KID1+\beta_{11}*chain\,.$$

(2) Expenditure decision by meat products

The second step is the estimation of the expenditure share equations of the Working-Leser demand system via seemingly unrelated regression (SUR). In the Working-Leser model, each expenditure share of the meat product is a linear function of the log of the total expenditure on all the meat items. The general form of the second stage equations of Working-Leser food demand function can be expressed as[3]:

[3] The definitions of each variable in the model are listed in Table 4.9.

$$\omega_i = a_0 + a_1 * \log(Mtotal) + a_2 * \log[M_i(-1)] + a_3 * Mills + a_4 * AD + a_5 * ADoth$$
$$+ a_6 * \text{hhinc} + a_7 * KID + a_8 * chains + a_9 * hhsize + a_{10} * T + a_{11} * ownprice + a_{12} * urban + \varepsilon_{it}$$

.

4.4 Model Testing and Estimation Results

Time Series Processing (TSP) version 5.0 was used as the econometric software for the estimation of the two-stage Working-Leser demand system. Estimation are performed respectively for Alberta and Ontario from 2002 to 2007. A two-step estimation following the Heien and Wessels (1990) Working-Leser demand system procedure is applied in the meat demand analysis. In the first step, a Probit regression is computed that determines the probability that a given household will purchase a particular meat type. The probability of purchase is then used as an instrument in the second-stage estimation of the Working-Leser demand system.

4.4.1 Meat Purchase Participation Decision Results for Ontario and Alberta

The probability results for the Probit model for Ontario and Alberta for each product group are reported in Tables 4.10 and 4.11. The statistical significance of each Probit model was examined by a likelihood ratio test with the null hypothesis that all slope estimates were zero. The Chi square statistics for each model are reported in the tables, indicating rejection of the null hypothesis. Therefore all the Probit regressions for the first stage of participation decision were statistically significant, many of the variables were significant at the 1% level. For Ontario, the generalized goodness of fit measure, scaled R-squared values, for (1) fresh pork, beef, poultry and others; (2) semi-processed pork, beef, poultry and others; (3) fully processed pork, beef, poultry and others were 0.21, 0.13, 0.14, 0.09, 0.17, 0.07, 0.07, 0.11, 0.14, 0.05, 0.14, and 0.11, respectively. The prediction accuracies for fresh beef and poultry were higher than 90 percent, prediction accuracies for fresh pork and fully processed beef were higher than 80 percent. For Alberta, the scaled R-squared values for (1) fresh pork, beef, poultry and others; (2) semi-processed pork, beef, poultry and others; (3) fully processed pork, beef, poultry and others were 0.23, 0.22, 0.14, 0.09, 0.13, 0.08, 0.09,

0.09, 0.15, 0.06, 0.11, and 0.08, respectively. The prediction accuracies for fresh beef and poultry were higher than 90 percent; prediction accuracy for fresh pork was higher than 80 percent.

Table 4.10 First-Step Probit Estimates for Ontario

Variables	fresh pork	fresh beef	fresh poultry	fresh others	semi-pork	semi-beef	semi-poultry	semi-others	fully-pork	fully-beef	fully-poultry	fully-others
Constant	-0.708***	-0.324	0.168	-2.796***	-1.295***	-1.867***	-1.168***	-0.889***	-1.057***	-1.990***	1.039***	-0.757***
	[0.252]	*[0.326]*	*[0.356]*	*[0.268]*	*[0.319]*	*[0.235]*	*[0.236]*	*[0.214]*	*[0.224]*	*[0.255]*	*[0.233]*	*[0.283]*
MTOTAL	0.003***	0.003***	0.004***	0.001***	0.002***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	[0.001]	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*
HHINC	-0.016	-0.025*	0.002	-0.005	-0.009	-0.018*	-0.013	-0.005	0.018**	-0.001	-0.005	-0.008
	[0.010]	*[0.013]*	*[0.014]*	*[0.009]*	*[0.009]*	*[0.009]*	*[0.009]*	*[0.009]*	*[0.009]*	*[0.010]*	*[0.009]*	*[0.009]*
HAGE	0.013***	0.009***	0.007***	0.011***	0.006***	0.001	-0.008***	0.001	0.012***	0.003*	-0.019***	0.001
	[0.002]	*[0.002]*	*[0.003]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*
T	-0.042	-0.013	-0.053***	0.029*	0.056***	0.091***	0.061***	-0.126***	0.019	0.001	-0.040***	0.078***
	[0.026]	*[0.016]*	*[0.017]*	*[0.015]*	*[0.010]*	*[0.011]*	*[0.012]*	*[0.010]*	*[0.023]*	*[0.015]*	*[0.015]*	*[0.010]*
CHAINS	0.181***	0.227***	0.290***	0.150***	0.136***	0.092***	0.183***	0.158***	0.107***	0.041*	0.149***	0.200***
	[0.023]	*[0.029]*	*[0.033]*	*[0.019]*	*[0.020]*	*[0.021]*	*[0.019]*	*[0.019]*	*[0.019]*	*[0.022]*	*[0.019]*	*[0.020]*
HHEDU1	-0.082	-0.004	-0.076	0.079	-0.074	0.054	-0.152***	-0.201***	-0.167***	0.118**	-0.134***	0.120**
	[0.063]	*[0.079]*	*[0.090]*	*[0.049]*	*[0.052]*	*[0.054]*	*[0.050]*	*[0.050]*	*[0.051]*	*[0.059]*	*[0.051]*	*[0.052]*
KID1	-0.049	0.375***	0.070	0.002	0.006	-0.014	-0.104*	0.003	0.027	0.046	0.190***	0.237***
	[0.073]	*[0.096]*	*[0.112]*	*[0.060]*	*[0.063]*	*[0.065]*	*[0.060]*	*[0.059]*	*[0.061]*	*[0.068]*	*[0.064]*	*[0.068]*
URBAN	-0.308***	0.124**	0.107*	0.125***	-0.105***	-0.079**	-0.153***	-0.020	-0.188***	-0.105**	-0.059	-0.004
	[0.045]	*[0.055]*	*[0.062]*	*[0.036]*	*[0.038]*	*[0.039]*	*[0.037]*	*[0.036]*	*[0.037]*	*[0.042]*	*[0.037]*	*[0.039]*
HHSIZE	-0.011	-0.217***	-0.082**	0.048**	0.016	-0.020	0.054**	0.048**	0.050**	0.050**	0.125***	0.116***
	[0.026]	*[0.032]*	*[0.036]*	*[0.021]*	*[0.022]*	*[0.023]*	*[0.021]*	*[0.021]*	*[0.022]*	*[0.025]*	*[0.022]*	*[0.023]*
AD	-0.053	-0.002	-0.041*	-0.085	0.027	---	-0.365	0.032	-0.055**	-0.205	-0.026*	0.017
	[0.043]	*[0.045]*	*[0.022]*	*[0.072]*	*[0.076]*	---	*[0.379]*	*[0.071]*	*[0.024]*	*[0.259]*	*[0.014]*	*[0.066]*
AD-OTH	0.007	0.016	-0.006	0.065***	0.009	0.015	0.024**	0.024***	0.000	0.013	-0.020**	-0.010
	[0.015]	*[0.015]*	*[0.018]*	*[0.012]*	*[0.015]*	*[0.010]*	*[0.010]*	*[0.009]*	*[0.011]*	*[0.011]*	*[0.010]*	*[0.011]*
Regression statistics												
Schwarz B.I.C.	2693.74	1572.77	1288.94	4051.31	3703	3255	3858.66	3992.64	3860.19	2751.99	3810.44	3422.56
Log likelihood	-2641.3	-1520.4	-1236.53	-3998.9	-3650.6	-3202.6	-3806.25	-3940.23	-3807.78	-2699.6	-3758.04	-3370.15
Scaled R2	0.207	0.132	0.144	0.094	0.165	0.070	0.074	0.107	0.136	0.046	0.137	0.109
Predictions	80.81%	90.96%	92.60%	62.97%	69.77%	76.45%	67.10%	64.46%	67.37%	82.87%	66.39%	72.31%

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

Table 4.11 First-Step Probit Estimates for Alberta

Variables	fresh pork	fresh beef	fresh poultry	fresh others	semi-pork	semi-beef	semi-poultry	semi-others	fully-pork	fully-beef	fully-poultry	fully-others
Constant	-0.421	-0.039	-0.177	-1.392***	-2.850***	-1.578***	-1.807***	-0.509	-1.843***	-0.909**	-0.113	-0.773*
	[0.399]	[0.487]	[0.531]	[0.390]	[0.467]	[0.339]	[0.375]	[0.316]	[0.344]	[0.355]	[0.338]	[0.410]
MTOTAL	0.004***	0.005***	0.004***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
HHINC	-0.016	0.008	-0.010	0.022*	0.017	0.002	0.041***	-0.005	-0.002	-0.019	-0.016	0.019
	[0.015]	[0.019]	[0.020]	[0.012]	[0.012]	[0.013]	[0.013]	[0.012]	[0.012]	[0.013]	[0.012]	[0.012]
HAGE	0.012***	0.008**	0.005	0.004	0.004	0.006**	-0.006**	0.001	0.011***	0.005**	-0.009***	-0.002
	[0.003]	[0.003]	[0.004]	[0.002]	[0.002]	[0.002]	[0.003]	[0.002]	[0.002]	[0.003]	[0.002]	[0.002]
T	-0.076*	-0.058**	-0.002	0.029	0.047***	-0.047***	0.119***	-0.073***	-0.027	0.044**	-0.002	0.074***
	[0.040]	[0.023]	[0.023]	[0.021]	[0.015]	[0.015]	[0.018]	[0.014]	[0.035]	[0.020]	[0.021]	[0.015]
CHAINS	0.092***	0.163***	0.188***	0.116***	0.096***	0.096***	0.118***	0.125***	0.117***	0.137***	0.107***	0.120***
	[0.027]	[0.035]	[0.039]	[0.021]	[0.021]	[0.022]	[0.023]	[0.021]	[0.022]	[0.023]	[0.021]	[0.022]
HHEDU1	-0.004	0.064	0.103	-0.034	-0.134*	0.009	0.079	0.012	-0.144*	-0.047	-0.137*	-0.144*
	[0.092]	[0.107]	[0.118]	[0.073]	[0.074]	[0.079]	[0.084]	[0.073]	[0.079]	[0.079]	[0.073]	[0.077]
KID1	-0.136	-0.434***	-0.075	0.026	0.048	-0.257***	0.130	0.035	0.147	-0.156	-0.190**	-0.047
	[0.121]	[0.149]	[0.161]	[0.089]	[0.092]	[0.094]	[0.096]	[0.090]	[0.097]	[0.097]	[0.092]	[0.097]
URBAN	-0.027	0.380***	0.102	0.177***	-0.073	0.083	0.021	-0.062	-0.204***	-0.084	0.054	0.079
	[0.065]	[0.076]	[0.085]	[0.051]	[0.053]	[0.056]	[0.058]	[0.052]	[0.055]	[0.057]	[0.052]	[0.054]
HHSIZE	-0.069*	-0.282***	-0.102*	-0.025	-0.012	-0.026	0.064*	0.053	0.128***	0.000	0.158***	0.101***
	[0.042]	[0.050]	[0.056]	[0.032]	[0.033]	[0.034]	[0.035]	[0.032]	[0.035]	[0.035]	[0.033]	[0.035]
AD	-0.076	-0.010	0.021	0.073	0.545***	---	1.271**	-0.153	-0.036	0.051	0.002	0.081
	[0.065]	[0.066]	[0.031]	[0.103]	[0.106]	---	[0.578]	[0.102]	[0.036]	[0.340]	[0.019]	[0.092]
AD-OTH	0.008	0.006	-0.008	0.012	0.070***	0.017	-0.015	-0.017	0.060***	-0.037**	0.012	0.015
	[0.023]	[0.021]	[0.026]	[0.017]	[0.021]	[0.014]	[0.015]	[0.013]	[0.017]	[0.015]	[0.014]	[0.016]
Regression statistics												
Schwarz B.I.C.	1192.87	795.171	649.692	2029.04	1912.2	1695.5	1580.12	1971.62	1779.49	1585.96	1968.65	1782.88
Log likelihood	-1144.7	-747.04	-601.558	-1980.9	-1864.1	-1647.3	-1531.98	-1923.49	-1731.36	-1537.8	-1920.52	-1734.75
Scaled R2	0.228	0.219	0.137	0.085	0.126	0.075	0.082	0.093	0.152	0.059	0.106	0.078
Predictions	84.12%	90.26%	92.68%	61.98%	65.88%	73.75%	77.00%	62.43%	71.62%	76.90%	63.78%	71.00%

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

Table 4.12 Marginal Effects for Probit Estimates of Ontario

Variables	fresh pork	fresh beef	fresh poultry	fresh others	semi-pork	semi-beef	semi-poultry	semi-others	fully-pork	fully-beef	fully-poultry	fully-others
Constant	-0.129***	-0.002	0.015	-0.996***	-0.501***	-0.539***	-0.413***	-0.298***	-0.303***	-0.451***	0.347***	-0.163***
	[0.064]	[0.024]	[0.013]	[0.113]	[0.113]	[0.073]	[0.092]	[0.092]	[0.091]	[0.065]	[0.090]	[0.093]
MTOTAL	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
HHINC	-2.00E-03	-0.001*	0.001	-0.007	-0.001	-0.004*	-0.005	-3.00E-03	0.008**	-1.00E-03	-0.001	-0.002
	[0.003]	[0.001]	[0.001]	[0.004]	[0.005]	[0.004]	[0.004]	[0.004]	[0.004]	[0.003]	[0.004]	[0.004]
HAGE	0.003***	0.001***	0.001***	0.003***	0.003***	0.001	-0.003***	0.001	0.003***	0.001*	-0.006***	0.001
	[0.001]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
T	-0.007	-0.001	-0.002***	0.013*	0.023***	0.028***	0.023***	-0.048***	0.009	0.001	-0.015***	0.025***
	[0.005]	[0.001]	[0.001]	[0.005]	[0.003]	[0.003]	[0.004]	[0.003]	[0.008]	[0.003]	[0.005]	[0.003]
CHAINS	0.025***	0.011***	0.008***	0.045***	0.034***	0.022***	0.056***	0.051***	0.040***	0.011*	0.044***	0.061***
	[0.006]	[0.003]	[0.003]	[0.008]	[0.008]	[0.007]	[0.008]	[0.008]	[0.008]	[0.006]	[0.008]	[0.007]
HHEDU1	-0.027	-0.007	-0.001	0.021	-0.010	0.006	-0.050***	-0.086***	-0.058***	0.008**	-0.043***	0.033**
	[0.019]	[0.007]	[0.004]	[0.026]	[0.027]	[0.020]	[0.025]	[0.027]	[0.027]	[0.019]	[0.025]	[0.023]
KID1	-0.018	0.020***	0.001	0.032	0.015	-0.002	-0.035*	0.005	0.017	0.006	0.066***	0.056***
	[0.017]	[0.009]	[0.004]	[0.029]	[0.025]	[0.022]	[0.027]	[0.026]	[0.028]	[0.020]	[0.030]	[0.025]
URBAN	-0.064***	0.008**	0.003*	0.053***	-0.029***	-0.026**	-0.051***	-0.011	-0.074***	-0.026**	-0.028	-0.005
	[0.015]	[0.007]	[0.003]	[0.021]	[0.021]	[0.016]	[0.019]	[0.020]	[0.021]	[0.014]	[0.021]	[0.018]
HHSIZE	-0.002	-0.014***	-0.002**	0.030**	0.013	-0.007	0.018**	0.015**	0.021**	0.017**	0.051***	0.029***
	[0.007]	[0.004]	[0.001]	[0.011]	[0.010]	[0.008]	[0.010]	[0.010]	[0.010]	[0.007]	[0.011]	[0.009]
AD	-0.012	-2.00E-03	-0.001*	-0.029	0.016	---	-0.125	0.012	-0.021**	-0.051	-0.011*	0.005
	[0.009]	[0.003]	[0.001]	[0.026]	[0.024]	---	[0.124]	[0.026]	[0.009]	[0.059]	[0.005]	[0.019]
AD-OTH	0.002	0.001	-0.001	0.026***	0.005	0.005	0.009**	0.010***	0.001	0.003	-0.007**	-0.003
	[0.003]	[0.001]	[0.001]	[0.004]	[0.005]	[0.003]	[0.003]	[0.003]	[0.004]	[0.002]	[0.003]	[0.003]

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

Table 4.13 Marginal Effects for Probit Estimates of Alberta

Variables	fresh pork	fresh beef	fresh poultry	fresh others	semi-pork	semi-beef	semi-poultry	semi-others	fully-pork	fully-beef	fully-poultry	fully-others
Constant	-0.087	-0.015	-0.020	-0.522***	-1.099***	-0.433***	-0.520***	-0.173	-0.628***	-0.199**	-0.107	-0.225*
	[0.083]	[0.035]	[0.025]	[0.160]	[0.174]	[0.116]	[0.122]	[0.136]	[0.124]	[0.109]	[0.140]	[0.138]
MTOTAL	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.000***	0.001***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
HHINC	-0.001	0.000	-1.00E-03	0.006*	0.006	0.006	0.011***	-0.004	-1.00E-03	-0.003	-0.007	0.005
	[0.003]	[0.002]	[0.001]	[0.006]	[0.006]	[0.006]	[0.005]	[0.006]	[0.006]	[0.005]	[0.007]	[0.006]
HAGE	0.002***	0.001**	0.001	0.001	0.001	0.001**	-0.002**	0.001	0.004***	0.001**	-0.003***	-0.001
	[0.001]	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
T	-0.014*	-0.004**	-1.00E-03	0.011	0.019***	-0.015***	0.036***	-0.027***	-0.009	0.013**	-0.002	0.024***
	[0.007]	[0.002]	[0.001]	[0.007]	[0.005]	[0.004]	[0.005]	[0.005]	[0.011]	[0.005]	[0.007]	[0.004]
CHAINS	0.014***	0.012***	0.007***	0.039***	0.031***	0.021***	0.038***	0.036***	0.046***	0.033***	0.047***	0.050***
	[0.006]	[0.005]	[0.003]	[0.009]	[0.009]	[0.008]	[0.008]	[0.009]	[0.009]	[0.008]	[0.009]	[0.009]
HHEDU1	-0.019	0.009	0.006	-0.007	-0.036*	0.027	0.033	0.003	-0.041*	-0.033	-0.030*	-0.059*
	[0.022]	[0.012]	[0.008]	[0.042]	[0.036]	[0.032]	[0.030]	[0.038]	[0.036]	[0.032]	[0.040]	[0.037]
KID1	-0.002	-0.017***	-0.004	0.046	0.043	-0.081***	0.032	0.026	0.038	-0.044	-0.072**	-0.033
	[0.029]	[0.015]	[0.009]	[0.038]	[0.040]	[0.037]	[0.030]	[0.042]	[0.039]	[0.035]	[0.046]	[0.036]
URBAN	-0.002	0.028***	0.006	0.071***	-0.033	0.028	0.003	0.038	-0.066***	-0.023	0.028	0.020
	[0.019]	[0.012]	[0.006]	[0.032]	[0.031]	[0.028]	[0.023]	[0.029]	[0.030]	[0.026]	[0.030]	[0.027]
HHSIZE	-0.003*	-0.010***	-0.002*	-0.012	-0.005	-0.015	0.016*	0.026	0.033***	0.001	0.055***	0.014***
	[0.011]	[0.006]	[0.003]	[0.014]	[0.016]	[0.014]	[0.013]	[0.015]	[0.014]	[0.013]	[0.015]	[0.014]
AD	-0.015	-0.001	0.001	0.032	0.210***	---	0.403**	-0.064	-0.013	0.022	0.001	0.029
	[0.011]	[0.004]	[0.001]	[0.038]	[0.036]	---	[0.161]	[0.037]	[0.012]	[0.085]	[0.007]	[0.028]
AD-OTH	0.002	1.00E-03	-1.00E-03	0.004	0.027***	0.006	-0.004	-0.007	0.021***	-0.011**	0.005	0.005
	[0.004]	[0.001]	[0.001]	[0.006]	[0.007]	[0.004]	[0.004]	[0.005]	[0.005]	[0.004]	[0.005]	[0.005]

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

Marginal effects for the independent variables for each meat product are reported in Tables 4.12 and 4.13. For both Ontario and Alberta, the effects of total meat expenditure and number of chains where a household shopped were all positive and significant. The more store chains that a household shopped at, the higher the probability was to purchase each meat product. Household incomes had insignificant effects for many of the meat products (except for fresh beef, semi-processed beef and fully processed pork in Ontario; except for fresh others and semi-processed poultry, in Alberta). In both provinces there is evidence of an increased tendency to purchase semi-processed pork, semi-processed poultry, and fully processed other meat products over time.

There are some differences between the two regions as well. For Ontario, the older the household heads, the higher the probability of purchasing all pork meat products, all fresh meat products, semi-/fully processed pork and fully processed beef, the lower the probability of purchasing semi-/fully processed poultry. The effect of presence of children in the household only had positive and statistically significant effects on fresh beef, fully processed poultry and other meats. Urban dwellers with higher education were less likely to purchase semi-processed poultry and fully processed pork products. Larger household sizes had positive and statistically significant effects on fresh other meat, semi-processed poultry/others and all fully processed meats. For Alberta, older households tended to purchase fresh/fully processed pork and all beef products. Households with presence of children had negative and statistically significant effects on fresh/semi-processed beef and fully processed poultry. Urban dwellers in Alberta were more likely to purchase fresh beef and other meats. Larger households were more likely to purchase fully processed pork, poultry and other meats.

Own advertising expenditures in Ontario had little relationship to meat purchases except for fresh/fully processed poultry and fully processed pork. In Alberta, advertising of semi-processed pork and poultry had positive and statistically significant effects. Other advertising expenditures for semi-processed pork and poultry had positive and statistically significant effects.

4.4.2 Meat Purchase Expenditure Decision Results for Ontario and Alberta

In order to select the best fitting model for the second stage Working-Leser demand system, a number of regressions were estimated using the basic models but restricting the coefficients. Likelihood ratio tests (LRT) were conducted to select the inclusion of variables in the best fitting model. Likelihood ratio tests are a statistical test which compares the goodness-of-fit between unrestricted and restricted models. The LRT is valid only when the models to be tested against each other are hierarchically nested. The objective criterion of likelihood ratio tests ($\lambda_{LR} = 2\left[\ln(L)_u - \ln(L)_r\right]$) is the Chi-square statistic. The degree of freedom is equal to number of additional parameters in the unrestricted model. If the likelihood ratio statistic of LRT ($\lambda_{LR} = 2\left[\ln(L)_u - \ln(L)_r\right]$) is significantly greater than the critical value (Chi-square statistic), then the unrestricted model is preferred by the LRT tests (Greene, 2003).

Table 4.14 Log-likelihood ratio test results for Ontario meat choice model specification

Model	**Log-likelihood**	**LR test statistics**
Original	77643.9	
Restricting		
Total exp	76932.1	1423.6 ***
Chains	77632.7	22.4 *
Lagged exp	76212.3	2863.2 ***
KID1	77639.4	8.9
URBAN	77602.2	83.3 ***
HH head age	77542.8	202.3 ***
HHEDU1	77623.6	40.6 ***
HHINC	77616.3	55.2 ***
HHSIZE	77596.8	94.2 ***
IMR	71901.9	11484.1 ***

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively
Chi-square(11) critical values are 24.72(1%), 19.68 (5%) and 17.28 (10%) .

Table 4.15 Log-likelihood ratio test results for Alberta meat choice model specification

Model	Log-likelihood	LR test statistics
Original	41186.6	
Restricting		
Total exp	40819.5	704.1 ***
chains	41149.9	43.3 ***
Lagged exp	40603.0	1137.1 ***
KID1	41155.4	32.2 ***
URBAN	41148.1	46.8 ***
HH head age	41122.3	98.4 ***
HHEDU1	41157.2	28.6 ***
HHINC	41141.8	59.5 ***
HHSIZE	41143.9	55.4 ***
IMR	37800.7	6741.7 ***

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively
Chi-square(11) critical values are 24.72(1%), 19.68 (5%) and 17.28 (10%) .

The likelihood ratios estimated from the unrestricted and restricted models for meat analysis are presented in Tables 4.14 and 4.15. For the Ontario meat choice model, the null hypotheses that total meat expenditure, inverse mills ratio (selection bias gained from first Probit model), own meat advertising, other meat advertising, one year lagged meat expenditure, urban, household head age, household education, household income, number of store chains shopped by a household and household size have no effect on meat expenditure shares (at 10 percent significance level) is rejected. The assumption that the variable of households with children has no effect on meat expenditure shares (at 10 percent significance level) fails to be rejected. Thus, examination using LRT tests indicates that all the variables except for the households with children variable should be retained in the final Working-Leser demand system (at 10 percent significance level). For Alberta the second stage meat choice model, the null hypotheses that total meat expenditure, inverse mills ratio (selection bias from first Probit model), own meat advertising expenditure, other meat advertising expenditure, number of store chains shopped by a household, one year lagged meat expenditure, households with children, urban, household head age, household

education, household income, and household size have no effect on meat expenditure shares (at 10 percent significance level) is rejected. Thus, examinations using LRT tests indicate that all the variables should be retained in the final Working-Leser demand system for Alberta. The specifications for both Ontario and Alberta are basically in the same form, the difference is that the households with children variable is dropped from the Ontario model.

Due to the adding-up restrictions, the equation for fully processed other meats was left out in both Ontario and Alberta models in order to avoid the singular matrices problem for Working-Leser demand system. Adding-up restrictions and the method of demographic scaling require the parameters on variables, such as demographics, and advertising expenditure, to sum to zero across all twelve equations. The parameters of the fully processed meat equation can be obtained with calculations from the rest of the equations in the demand system. The estimation procedure was the LSQ command in Time Series Processing (TSP) version 5.0 with iterative seemingly unrelated regressions (SUR). The estimated parameters for the Working-Leser demand system of both regions are presented in Tables 4.16 and 4.17. For Ontario, the goodness of fit measure, R-squared values, for (1) fresh pork, beef, poultry and others; (2) semi-processed pork, beef, poultry and others; (3) fully processed pork, beef, poultry and others ranged from 0.28 for fresh poultry to 0.40 for semi-processed beef. For Alberta, the goodness of fit measure, R-squared values, for (1) fresh pork, beef, poultry and others; (2) semi-processed pork, beef, poultry and others; (3) fully processed pork, beef, poultry and others ranged from 0.29 for fresh poultry to 0.44 for semi-processed beef as well. Other goodness of fit statistics, Durbin-Watson statistics, AIC, BIC and log likelihood values are also presented in Table 4.16 and Table 4.17.

Table 4.16 Second-Step Working-Leser Model Estimates for Ontario

Variables	**fresh pork**	**fresh beef**	**fresh poultry**	**fresh others**	**semi-pork**	**semi-beef**	**semi-poultry**	**semi-others**	**fully-pork**	**fully-beef**	**fully-poultry**	**fully-others**
Constant	-0.076	-0.261	-1.041*	-0.042	0.053	0.140***	0.152***	0.256**	0.111***	0.008	0.744*	0.956
	[-1.381]	[-1.177]	[-1.659]	[-0.477]	[1.562]	[5.752]	[2.683]	[2.537]	[6.820]	[1.489]	[1.766]	[1.137]
Total exp	-0.008**	0.002	-0.065***	-0.036***	-0.014***	-0.003***	-0.034***	-0.022***	-0.034***	-0.004***	-0.060***	0.278***
	[-2.163]	[0.253]	[-9.816]	[-11.707]	[-5.641]	[-3.136]	[-14.131]	[-13.166]	[-14.989]	[-5.380]	[-16.637]	[24.789]
IMR	0.054***	0.067***	0.093***	0.051***	0.041***	0.024***	0.044***	0.031***	0.043***	0.019***	0.051***	-0.518***
	[27.210]	[16.225]	[22.057]	[33.773]	[35.001]	[53.564]	[38.097]	[37.357]	[37.081]	[42.521]	[27.991]	[-57.161]
Chains	0.003*	-0.006**	0.001	0.003**	-0.001	0.001**	-0.001	0.001	-0.001	-0.001	0.002	-0.003
	[1.941]	[-2.316]	[0.492]	[2.293]	[-0.279]	[2.152]	[-0.121]	[0.126]	[-0.358]	[-1.163]	[1.567]	[-1.066]
AD	-0.004*	-0.005	-0.011*	-0.006	-0.014***	N/A	0.010	-0.004	-0.004***	-0.006	0.001	0.044
	[-1.712]	[-0.999]	[-1.657]	[-1.518]	[-2.685]	N/A	[0.214]	[-0.647]	[-4.213]	[-0.980]	[0.527]	[0.915]
AD-OTH	-0.001	0.002*	-0.010*	0.004***	-0.002**	0.001**	-0.001	-0.001	0.001	-0.001	0.004**	0.001
	[-0.028]	[1.786]	[-1.745]	[3.076]	[-2.223]	[2.018]	[-0.645]	[-0.848]	[0.688]	[-0.117]	[2.267]	[0.154]
Own price	0.079***	0.188*	0.814**	0.015	0.042**	-0.078***	-0.017	-0.068**	-0.007	0.004	-0.420	-0.553
	[3.286]	[1.708]	[2.046]	[0.410]	[2.061]	[-4.847]	[-0.816]	[-2.049]	[-0.638]	[0.866]	[-1.266]	[-0.961]
Lagged exp	0.044***	0.088***	0.080***	0.026***	0.023***	0.004***	0.021***	0.015***	0.022***	0.005***	0.035***	-0.363***
	[21.783]	[24.401]	[20.892]	[14.876]	[16.957]	[5.881]	[13.342]	[13.412]	[15.191]	[6.448]	[17.398]	[-46.084]
URBAN	-0.014***	0.001	0.022***	0.009***	-0.005**	-0.001	-0.001	0.001	-0.007***	0.001	-0.002	-0.005
	[-5.073]	[0.073]	[4.948]	[3.812]	[-2.541]	[-0.765]	[-0.678]	[0.728]	[-3.944]	[0.890]	[-0.569]	[-0.821]
HH head age	0.001***	0.001	-0.001**	0.001***	0.000**	0.001	-0.001**	-0.001	0.001***	0.001*	-0.002***	0.001
	[4.876]	[0.952]	[-2.091]	[5.999]	[2.034]	[1.300]	[-2.059]	[-0.529]	[4.784]	[1.838]	[-12.268]	[0.557]
HHEDU1	-0.006	0.002	0.011*	0.003	-0.007***	-0.001	0.002	-0.001	-0.012***	-0.001	-0.003	0.012
	[-1.534]	[0.361]	[1.801]	[0.808]	[-2.710]	[-1.595]	[0.655]	[-0.486]	[-5.042]	[-0.788]	[-0.645]	[1.613]
HHINC	-0.001*	-0.003***	0.003***	0.001	-0.001	-0.001***	0.001***	-0.001***	0.001**	-0.001	0.001*	-0.001
	[-1.879]	[-2.816]	[2.652]	[1.262]	[-0.028]	[-3.527]	[2.709]	[-3.107]	[2.198]	[-0.573]	[1.724]	[-0.699]
HHSIZE	-0.005***	-0.016***	-0.009***	0.003***	0.001	0.001	0.001	0.003***	0.001	0.001***	0.008***	0.012***
	[-4.050]	[-7.450]	[-4.423]	[2.814]	[1.319]	[0.168]	[0.302]	[5.049]	[1.352]	[3.514]	[6.277]	[4.136]
Regression statistics												
Std. error	0.088	0.152	0.147	0.080	0.059	0.022	0.062	0.042	0.058	0.020	0.094	
R-squared	0.365	0.328	0.280	0.332	0.350	0.397	0.311	0.328	0.348	0.315	0.377	
LM het. test	224.1***	54.9***	265.5***	451.2***	252.6***	195.3***	728.9***	354.1***	492.1***	241.7***	525.4***	
Durbin-Watson	1.056	0.936	0.909	1.034	1.171	1.542	1.020	1.068	1.107	1.405	0.943	

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are t-statistics].

Table 4.17 Second-Step Working-Leser Model Estimates for Alberta

Variables	**fresh pork**	**fresh beef**	**fresh poultry**	**fresh others**	**semi-pork**	**semi-beef**	**semi-poultry**	**semi-others**	**fully-pork**	**fully-beef**	**fully-poultry**	**fully-others**
Constant	-0.250***	-0.639	0.845**	0.080**	-0.065***	-0.002	0.076*	0.019	0.035	0.021**	0.259***	0.621
	[-3.561]	[-1.438]	[2.002]	[2.177]	[-2.649]	[-0.232]	[1.682]	[0.404]	[0.605]	[2.405]	[3.968]	[1.195]
Total exp	0.024***	0.063***	-0.102***	-0.033***	-0.011***	-0.004***	-0.014***	-0.018***	-0.051***	-0.004***	-0.063***	0.212***
	[3.794]	[6.402]	[-10.747]	[-8.576]	[-4.434]	[-3.646]	[-7.083]	[-9.443]	[-11.621]	[-3.550]	[-11.843]	[13.834]
IMR	0.066***	0.076***	0.113***	0.048***	0.034***	0.020***	0.034***	0.027***	0.053***	0.017***	0.057***	-0.546***
	[20.844]	[13.774]	[18.908]	[26.590]	[30.099]	[37.578]	[33.717]	[29.080]	[24.779]	[29.677]	[22.586]	[-43.717]
Chains	-0.001	-0.005*	0.001	0.003***	-0.001	0.001***	0.002***	0.002***	0.001	0.001*	0.003	-0.007**
	[-0.276]	[-1.887]	[0.359]	[2.648]	[-0.366]	[3.045]	[2.670]	[3.357]	[0.018]	[1.658]	[1.609]	[-2.085]
AD	-0.006*	-0.012	0.002	0.003	0.023***	N/A	0.179**	-0.005	0.002	-0.010	0.002*	-0.179***
	[-1.799]	[-0.612]	[0.332]	[0.509]	[4.517]	N/A	[2.532]	[-1.333]	[1.002]	[-1.473]	[1.784]	[-2.972]
AD-OTH	0.001	-0.007**	-0.001	0.002**	0.004***	0.001**	-0.002***	0.001	0.001	-0.001***	0.001	-0.002
	[0.599]	[-2.148]	[-0.019]	[2.440]	[3.993]	[2.028]	[-4.635]	[1.587]	[0.796]	[-4.015]	[0.686]	[-0.434]
Own price	0.140***	0.371**	-0.256	-0.020	0.016***	-0.001	-0.002	0.003	0.054	0.010*	-0.019	-0.298
	[5.125]	[1.962]	[-1.051]	[-0.786]	[3.506]	[-0.068]	[-0.116]	[0.208]	[1.620]	[1.800]	[-0.444]	[-1.119]
Lagged exp	0.034***	0.082***	0.081***	0.019***	0.010***	0.008***	0.003*	0.004***	0.020***	0.008***	0.030***	-0.299***
	[11.258]	[17.103]	[15.054]	[9.416]	[6.707]	[9.179]	[1.945]	[2.813]	[8.379]	[7.791]	[10.909]	[-29.359]
KID1	0.001	0.011	0.009	-0.004	0.003	0.005***	-0.002	0.001	-0.011*	-0.002	-0.023***	0.014
	[0.065]	[1.002]	[0.816]	[-0.807]	[0.831]	[3.577]	[-0.839]	[0.037]	[-1.931]	[-1.047]	[-3.162]	[1.049]
URBAN	-0.007	0.014**	-0.002	0.006**	-0.002	0.002***	0.001	0.002	-0.015***	-0.001	-0.008**	0.010
	[-1.634]	[2.232]	[-0.291]	[1.961]	[-0.935]	[2.813]	[0.535]	[1.233]	[-4.445]	[-1.506]	[-1.993]	[1.280]
HH head age	0.001***	0.001	-0.001**	0.001	-0.001	0.001***	-0.001**	0.001	0.001***	-0.001*	-0.001***	0.001*
	[3.478]	[1.034]	[-2.238]	[0.976]	[-1.055]	[2.827]	[-2.031]	[0.489]	[3.220]	[-1.756]	[-7.488]	[1.736]
HHEDU1	-0.018***	0.017*	0.015	-0.001	-0.001	0.001	0.001	0.002	-0.018***	0.001	0.001	0.002
	[-2.905]	[1.924]	[1.599]	[-0.278]	[-0.166]	[0.091]	[0.159]	[0.985]	[-3.855]	[0.092]	[0.240]	[0.137]
HHINC	-0.005***	-0.004***	0.003**	0.001**	-0.001	-0.001	0.001***	0.001	-0.001	-0.001**	-0.001	0.006***
	[-4.572]	[-2.896]	[2.075]	[2.050]	[-1.150]	[-0.015]	[3.075]	[0.368]	[-1.575]	[-2.099]	[-0.660]	[3.119]
HHSIZE	0.001	-0.015***	-0.006	-0.002	-0.001	-0.001	0.001	0.002**	0.007***	0.001*	0.013***	0.001
	[0.253]	[-3.640]	[-1.583]	[-0.863]	[-0.442]	[-1.142]	[0.316]	[1.961]	[3.318]	[1.795]	[4.761]	[0.057]
Regression statistics												
Std. error	0.100	0.146	0.148	0.068	0.042	0.018	0.035	0.034	0.076	0.019	0.096	
R-squared	0.363	0.405	0.285	0.337	0.336	0.441	0.356	0.316	0.329	0.345	0.350	
LM het. test	71.5***	6.6 **	217.4***	201.1***	223.5***	241.2***	175.6***	180.9***	266.1***	55.9***	424.2***	
Durbin-Watson	1.201	0.938	1.029	1.361	1.413	1.244	1.204	1.346	1.189	1.381	0.978	

Balanced panel Number of observations: 2540; Number of household: 508; AIC= -41017.5; BIC= -40383.2; Log likelihood=41171.5

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are t-statistics].

In the second stage Working-Leser demand system explaining the level of expenditure for each of the twelve meat products, it was noticeable that all the inverse mills ratios in both Ontario and Alberta regions were statistically significant in the regressions, which implied that the instrumental variables incorporating the censoring latent variables from the first stage should be included in the second-stage estimation. All the lagged one year meat expenditure variables (except for fully processed other meats in Ontario, and fully processed other meats in Alberta) had statistically significant and positive impacts on meat expenditure shares in both regions. This indicates that past consumption is quite significant in explaining current meat purchase behaviour. In both Ontario and Alberta, total meat expenditures had significant impacts except for fresh beef in Ontario; it was observed that younger household heads with higher incomes were more likely to spend more on fresh and semi-processed poultry products; older rural dwellers were more likely to purchase fully processed pork products as well. In Ontario and Alberta, larger households were more likely to purchase semi-processed others and fully processed beef and poultry products, spend less on fresh beef, this might be explained by the fact that larger households might have less time for cooking fresh beef products, therefore more processed meat products were preferred.

The results for each of the above models showed some differences across regions as well. In Ontario, higher income households were spending less on fresh pork/beef, and semi-processed beef and other meats, while these in Alberta were spending less on fresh pork and beef, but both regions showed that there was a strong relationship between increasing incomes and fresh/semi-processed poultry expenditures. The reason is not surprising, according to past studies, there is a great increase in poultry purchases due to health considerations and taste preferences (Chen and Veeman, 1991; Reynolds and Goddard, 1991). In Alberta, the number of chains that a household shopped at (store loyalty) had a statistically significant and positive impact on fresh other meat and semi-processed beef, poultry and others. Households with children in Alberta had a statistically significant positive impact on semi-processed beef and a negative impact on fully processed pork and poultry. Own advertising expenditures had statistically significant and positive impacts on semi-processed

pork/poultry and fully processed poultry in Alberta. In Ontario, other meat advertising expenditures had negative and statistically significant effects on fresh poultry and semi-processed pork products, while in Alberta other meat advertising expenditures only had negative and statistically significant effects on fresh beef and semi-processed beef and poultry and fully processed beef products.

Table 4.18 presents the own price effects for each of the twelve meat products. Most of the own price effects are negative (except for fresh poultry in Ontario and fresh and semi-processed beef in Alberta, however they are not significant at 10 percent confidence level or better). The possible reason for positive own-price elasticities for fresh and fully processed beef in Alberta is that they might be due to BSE issues in Canada. The own price elasticities for semi-processed beef and other meat, and fully processed pork in Ontario and fresh poultry and other meat and semi-processed beef in Alberta are above one and relative elastic, which imply that a one percent change in price will have an impact larger than one percent on the quantity demanded of the meat products.

Table 4.18 Own price elasticities for Ontario and Alberta

	Ontario		***Alberta***	
	Estimate	**t-statistic**	**Estimate**	**t-statistic**
fresh pork	**-0.29**	*-1.34*	**-0.01**	*-0.03*
fresh beef	**-0.29**	*-0.69*	**0.30**	*0.45*
fresh poultry	**2.32**	*1.40*	**-2.03** **	*-2.09*
fresh others	**-0.70**	*-0.95*	**-1.45** **	*-2.47*
semi-pork	**-0.14**	*-0.32*	**-0.23**	*-1.02*
semi-beef	**-9.35** ***	*-6.66*	**-1.03** ***	*-2.65*
semi-poultry	**-1.67** *	*-1.94*	**-1.15**	*-1.00*
semi-others	**-3.87** ***	*-2.79*	**-0.83**	*-0.84*
fully-pork	**-1.17** ***	*-4.26*	**-0.05**	*-0.09*
fully-beef	**-0.32**	*-0.43*	**0.44**	*0.55*
fully-poultry	**-6.48**	*-1.37*	**-1.28** *	*-1.90*
fully-others	**-6.73**	*-1.13*	**-4.31**	*-1.46*

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively.

The expenditure elasticity measures by how much quantity demanded changes for expenditure on a particular commodity group increased by 1 percent. Expenditure elasticities for both regions were represented in Table 4.19. The elasticities are calculated at the sample means of explanatory variables. All meat expenditure elasticities, when statistically significant (at 10 percent significance level), have the expected positive signs. It was observed that there are some dramatic differences between the various types of meat products. Fully processed other meats in both regions had the highest expenditure elasticities, since many of the fully processed meat products were seafood in further processed form, they were expected to be luxuries with elasticities larger than one. There seemed to be less interest in fresh other meats and fully processed poultry products in Ontario having some of the lowest expenditure elasticities (0.29 and 0.22) compared to other meat categories. This may be due to the fact that there has been much product development occurring in frozen and fully processed meat subgroups, some of them may even be regarded as experimental products that manufacturers try to test the market and consumer acceptances of those products. Therefore many of the fully processed meat products may be new to consumers and many of the consumers may have not purchased or been aware of those new products, thus the expenditure elasticities for those meat subgroups were seen to be smaller than the regular meat product forms like the traditional fresh meat subgroups. Expenditure elasticities for fresh pork and beef were around one in Ontario, compared with those in Alberta having slightly larger than one. Expenditure elasticities for fresh poultry, semi-processed pork/beef meat categories in both regions were less than one indicating that those meat products are expenditure inelastic and households may already regard them as necessary goods due to the traditional consumption aspects.

Table 4.19 Expenditure elasticities for Ontario and Alberta

	Ontario		*Alberta*	
	Estimate	**t-statistic**	**Estimate**	**t-statistic**
fresh pork	**0.93** ***	*17.27*	**1.17** ***	*25.06*
fresh beef	**1.01** ***	*21.43*	**1.22** ***	*26.76*
fresh poultry	**0.73** ***	*15.60*	**0.59** ***	*11.47*
fresh others	**0.29** ***	*2.64*	**0.23**	*1.59*
semi-pork	**0.71** ***	*8.15*	**0.50** ***	*3.50*
semi-beef	**0.71** ***	*4.59*	**0.59** ***	*3.66*
semi-poultry	**-0.33**	*-1.49*	**-0.08**	*-0.29*
semi-others	**0.09**	*0.57*	**-0.02**	*-0.10*
fully-pork	**0.15**	*1.34*	**0.11**	*0.96*
fully-beef	**0.30**	*1.20*	**0.46** *	*1.72*
fully-poultry	**0.22** ***	*2.70*	**0.07**	*0.57*
fully-others	**3.89** ***	*23.96*	**3.35** ***	*19.72*

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively.

4.5 Summary

This chapter provides not only a statistical description and summary of variables used in the meat choice models, but also the empirical estimation results and discussions. The estimation of the two-stage Working-Leser demand system is performed respectively for Alberta and Ontario from 2002 to 2007, following a two-step Heien and Wessels (1990) Working-Leser demand system procedure in the meat demand analysis. In the first step, a Probit regression is conducted to measure the probability that a given household will purchase a particular meat type. Then the inverse mills ratio representing the probability of purchase is used as an instrumental variable in the second-stage estimation of the Working-Leser demand system.

The highlights of the estimation results show that there is significant variability existing in the markets for meat products by species and by level of processing (Table 4.20). Household demographic variables play an important role in meat choice decisions in both Alberta and Ontario. The results for meat analysis showed some

similarities and some differences across regions as well. The number of store chains that a household shopped at, representing to some extent store loyalty, does not appear to have an impact on fully processed meat preferences for Ontario households, while in Alberta, semi-processed meat (except for pork) buyers did not show statistically significant store loyalty, as the more stores a household shopped at, the higher meat expenditure shares for pork and poultry. Habit-formation effects can also be identified in all the meat expenditures for both Ontario and Alberta households.

The implications for meat sales are summarized in Table 4.20. Meat advertising expenditures have significant impacts on meat sales of fresh pork/poultry, and semi-/fully processed pork products in Ontario, and fresh/semi-processed pork, semi-/fully processed poultry, and fully processed other meat products in Alberta. It also shows the characteristics of households buying each type of meat in both regions, for example, if the meat manufacturers were to develop a fully processed poultry product to be sold in the Ontario market, younger households in Ontario with higher incomes and larger household sizes are most likely to purchase it; if the meat manufacturers were to develop a fully processed other meat product (e.g. seafood) to be sold in the Alberta market, older households in Alberta with higher incomes are most likely to purchase it. Grocery retailers can use this information to better market to their targeted customers to increase meat sales. Livestock producers, processors and retailers can use this information to understand the relationships between households' meat demand and household demographics in order to predict changes in meat demand and develop effective products and marketing strategies that respond to changing consumer needs, feeding into new product development; evaluating existing and potential policy options, which ultimately may increase the value of total sales.

Table 4.20 Summary of the findings for the meat choice models, Ontario and Alberta, 2002-2007

	Meat types	*Price Elas.*	*Exp Elas.*	*Own Ad*	*Characteristics of HH who buy*
ON	**fresh pork**	N	Unit elastic	Significant	Older rural dwellers with lower incomes and smaller household sizes
	fresh beef	N	Unit elastic	N	Household heads with lower incomes and smaller household sizes
	fresh poultry	N	Inelastic	Significant	Younger urban dwellers with higher incomes, smaller household sizes, better education
	fresh others	N	Inelastic	N	Older urban dwellers with larger household sizes
	semi-pork	N	Inelastic	Significant	Older rural dwellers with lower education
	semi-beef	Elastic	Inelastic	N	Households with lower incomes
	semi-poultry	Elastic	N	N	Younger households with higher incomes
	semi-others	Elastic	N	N	Larger sized households with lower incomes
	fully-pork	Elastic	N	Significant	Older rural dwellers with lower education and higher incomes
	fully-beef	N	N	N	Older households with larger household sizes
	fully-poultry	N	Inelastic	N	Younger households with higher incomes and larger household sizes
	fully-others	N	Elastic	N	Households with larger household sizes
AB	**fresh pork**	N	Elastic	Significant	Older households with lower incomes
	fresh beef	N	Elastic	N	Urban dwellers with better education, lower incomes and smaller household sizes
	fresh poultry	Elastic	Inelastic	N	Younger households with higher incomes
	fresh others	Elastic	N	N	Urban dwellers with higher incomes
	semi-pork	N	Inelastic	Significant	All households
	semi-beef	Elastic	Inelastic	N	Older urban dwellers with children
	semi-poultry	N	N	Significant	Younger households with higher incomes
	semi-others	N	N	N	Households with larger household sizes
	fully-pork	N	N	N	Older rural dwellers with lower education and larger household sizes, without children
	fully-beef	N	Inelastic	N	Younger households with lower incomes
	fully-poultry	Elastic	N	Significant	Younger rural dwellers with larger household sizes
	fully-others	N	Elastic	Significant	Older households with higher incomes

Note: N denotes the parameters are not statistically significant at 10 percentage level or better.

Chapter 5 Canadian Store Choice Analysis

5.1 Introduction

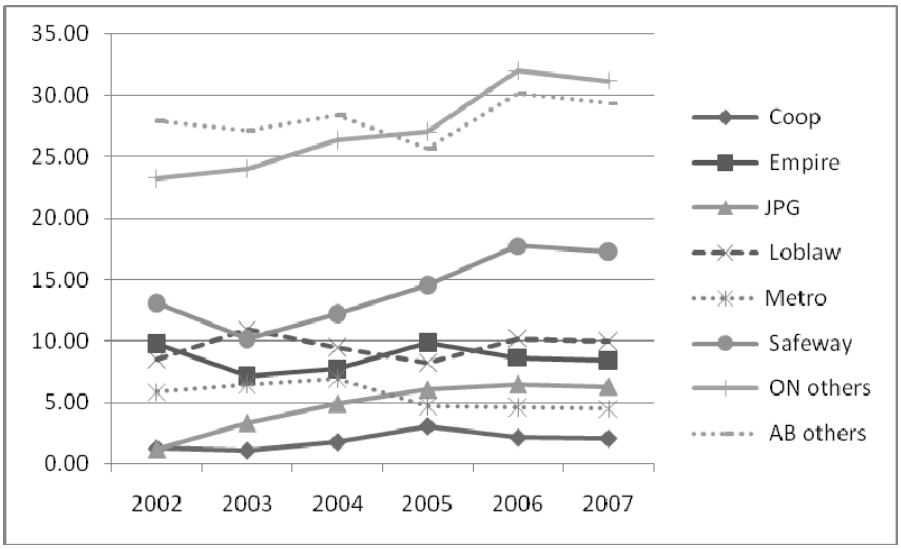
The second objective, to investigate how Canadian households in Alberta and Ontario make their store choice decisions in purchasing meat products is pursued in this chapter. In particular, the analysis focuses on the impacts of store advertising and household demographic variables on meat purchase patterns at store chains. Store banners were aggregated to six major store chains in both regions, Co-op, Metro, Empire (e.g. Sobeys), Loblaw, Safeway, and "all others" in Ontario, as compared to Alberta where JPG (e.g. Save On Foods chains) is a more major chain and the six store chains Co-op, JPG, Empire (e.g. Sobeys), Loblaw, Safeway and "all others" in Alberta were used. The structure of this chapter is: first the data generation for the analysis is described followed by the data descriptive statistics. Then the model testing, model specification and econometric methods are presented. The model estimation results and summary are provided in the final section of the chapter.

5.2 Data Setup and Descriptive Statistics

The store choice analysis focuses on the Canadian household purchase information in the provinces of Ontario and Alberta over the time period 2002 to 2007. The same households in ACNielsen Homescan™ panel as in the first meat choice analysis were used, in total 1036 households in Ontario and 508 households in Alberta. Advertising expenditures, measured in millions of Canadian dollars, by store chains are also considered in the analysis, as obtained from Nielsen Media Measurement™ data from year 1999 to 2005 (Table 5.1). The advertising expenditures from Nielsen contain annual national advertising expenditures by companies for their store banners and store chains. Advertising expenditures are summed according to the six store chains in each region in the study. Although the advertising expenditure is national data which represents country wide advertising effects, it can still be used as proxy

advertising data for Alberta and Ontario with one year lag[4] to allow for lagged advertising response (for estimation convenience, it is assumed that 2006 year had the same advertising expenditures as those in 2005). Every household faces the same store advertising expenditures in the analyses, and there is no advertising expenditure variability across households within the same region and across the same calendar year. Thus two kinds of advertising expenditures are created for each store equation: "own store advertising expenditure" and "all other stores' advertising expenditure" to deal with the small variation issues. Moreover the aggregate price level information for each store chain in both regions is not available in ACNielsen Homescan™ panel. Thus the analysis in this chapter only focuses on the impacts of household demographic variables, number of store chains that households shopped at and store advertising expenditures on store choice decisions and purchase patterns.

Figure 5.1 Proxy store advertising expenditures (Million C$) for Ontario and Alberta models, 2002-2007



Source: Nielsen Media Measurement™ national advertising data, 2002-2007.

[4] It is assumed that the general store advertising expenditure has a one year lag before affecting meat purchases.

Table 5.1 Proxy store advertising expenditures (Million C$) for Ontario and Alberta models, 2002-2007

Store chains	*Co-op*	*Empire*	*JPG*	*Loblaw*	*Metro*	*Safeway*	*ON others*	*AB others*
2002	1.26	9.79	1.18	8.51	5.84	13.12	23.23	27.89
2003	1.09	7.12	3.35	10.90	6.46	10.19	24.00	27.11
2004	1.79	7.76	4.91	9.50	6.93	12.19	26.34	28.36
2005	3.08	9.90	6.05	8.24	4.73	14.54	27.01	25.69
2006	2.13	8.64	6.48	10.21	4.60	17.72	31.98	30.10
2007	2.08	8.42	6.31	9.95	4.48	17.26	31.15	29.32

Source: Nielsen Media Measurement™ national advertising data, 2002-2007.

5.2.1 Store Chains and Market Share

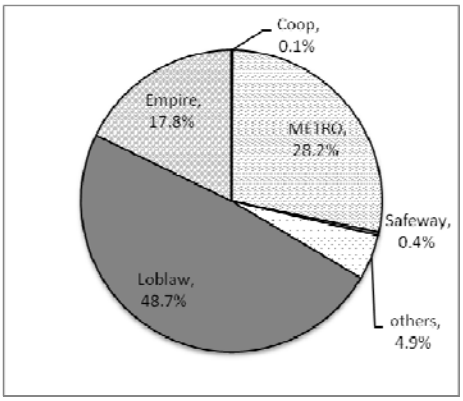
Aggregate annual store meat expenditure market shares for each of the grocery store chains over the period 2002 to 2007 (for the Homescan™ panellists in this study) are reported in this section. Tables 5.2 and 5.3 below report aggregate market shares for each of the six grocery store chains in Ontario and Alberta. In Ontario, Loblaw grocery store chains, with an average market share of 49 percent, have the largest meat expenditure share in the market; while in Alberta, Safeway, with an average 39 percent market share, is the largest in meat store expenditure share.

Table 5.2 Market share for store meat expenditures (C$) in Ontario 2002-2007

YEAR	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Co-op	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Empire	15.5%	17.6%	17.7%	19.2%	18.3%	18.2%
Metro	28.4%	31.1%	29.2%	27.3%	27.5%	26.2%
Loblaw	52.5%	47.2%	47.7%	47.7%	48.1%	49.5%
Safeway	0.1%	0.4%	0.6%	0.4%	0.3%	0.4%
Others	3.5%	3.6%	4.8%	5.4%	5.9%	5.7%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Finger 5.2 Average market share for store chains in Ontario 2002-2007



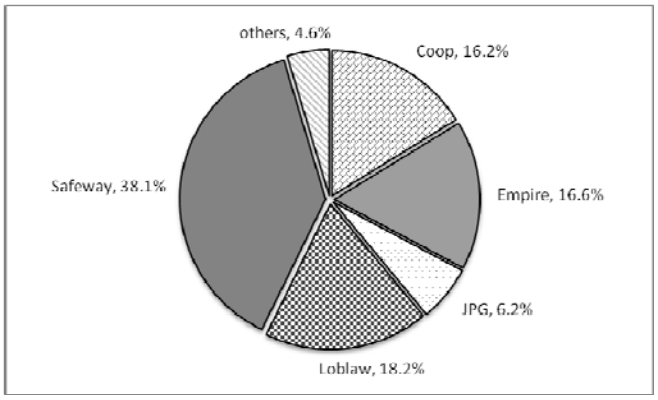
Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Table 5.3 Market share for store meat expenditures (C$) in Alberta 2002-2007

YEAR	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Co-op	17.4%	15.5%	15.2%	15.0%	17.2%	17.3%
Empire	17.1%	15.6%	15.5%	17.2%	17.9%	16.1%
JPG	7.7%	6.7%	5.9%	4.9%	5.8%	6.5%
Loblaw	15.1%	16.6%	16.0%	18.4%	20.7%	22.7%
Safeway	39.2%	42.0%	42.5%	39.9%	33.5%	31.2%
Others	3.6%	3.7%	4.8%	4.6%	4.8%	6.2%

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Finger 5.3 Average market share for store chains in Alberta 2002-2007



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

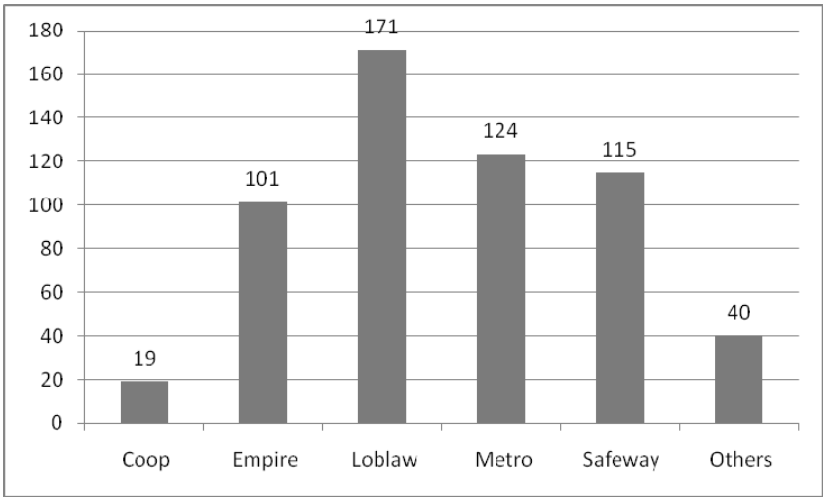
From the Table 5.4, it is noticeable that over the period 2002 to 2007, on average, a household spent a total value of $171 at Loblaw chains in Ontario, and only $19 at Co-op chains in Ontario.

Table 5.4 Ontario annual average store expenditure per household (C$) 2002-2007

Year	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
Co-op	39	10	10	8	13	19
Empire	83	92	111	110	109	101
Loblaw	166	154	179	179	168	182
Metro	112	128	136	125	124	116
Safeway	77	75	227	104	76	111
Others	34	33	44	41	44	41

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.4 Ontario average store expenditure per household (C$) 2002-2007



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

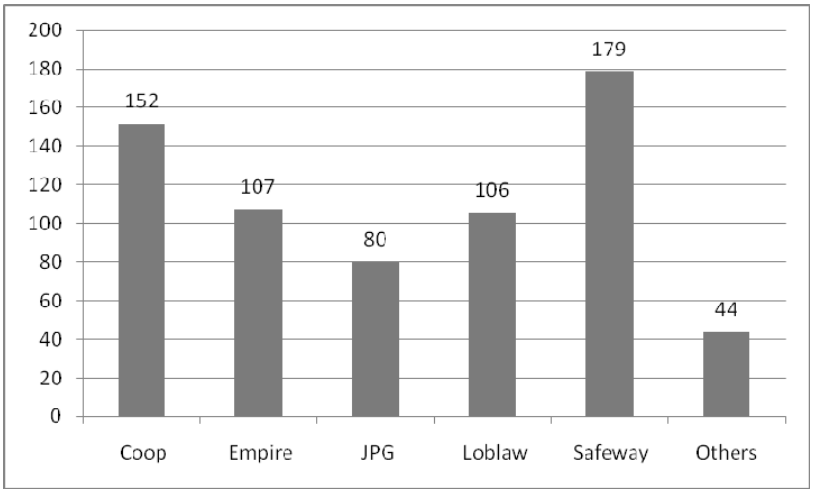
In Alberta over the period 2002 to 2007, on average, a household spent a total value of $179 at Safeway chains, as reported in Table and Figure 5.5.

Table 5.5 Alberta annual average store expenditure per household (C$) 2002-2007

Year	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***
Co-op	159	152	148	132	164	159
Empire	114	104	102	109	116	97
JPG	86	77	85	65	82	84
Loblaw	84	102	95	113	120	117
Safeway	152	205	202	200	151	158
Others	42	39	40	47	42	51

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.5 Alberta average store expenditure per household (C$) 2002-2007

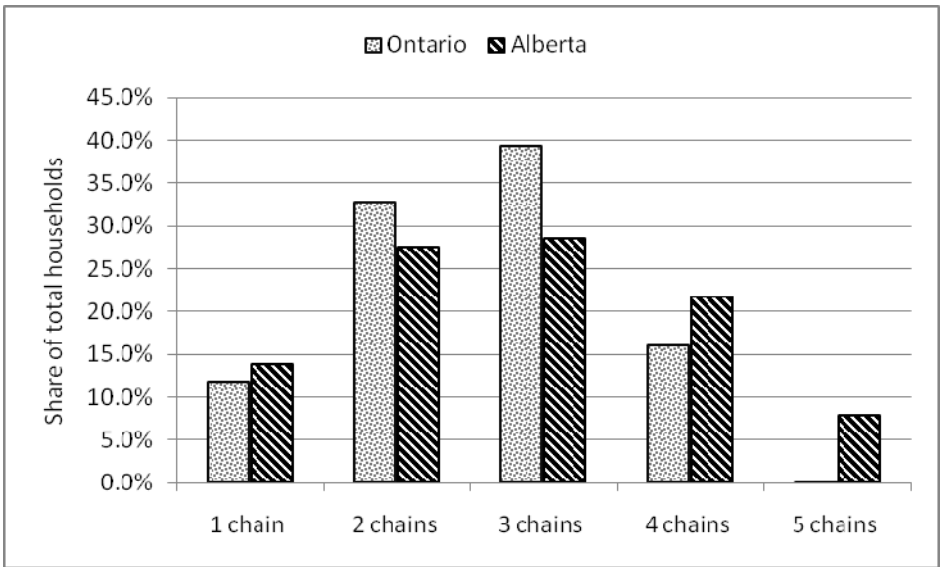


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

5.2.2 Number of Store Chains that a Household Shopped At (Store Loyalty)

Figure 5.6 indicates that households had little store loyalty as most of the households (over 86 percent of the households in Ontario and over 78 percent of households in Alberta) regularly shopped at two to four grocery store chains to purchase meat products. Only 12 percent of the households in Ontario and 14 percent in Alberta regularly purchase meat products at the same grocery chain. The implication of this finding suggests that for meat manufacturers, when they develop new products, it may be beneficial to cooperate with more than one store chain to get the potential maximum sales.

Figure 5.6 Number of store chains that a household shopped at by share of households in Ontario and Alberta 2002-2007



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

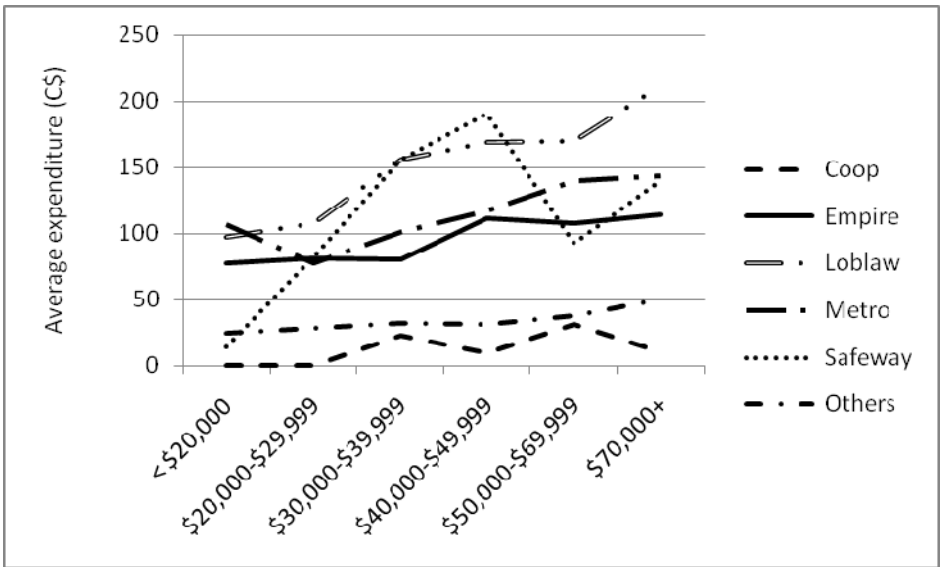
5.2.3 Household Food Expenditure Patterns, Levels

In the same way as done in the meat choice analysis, segmentation variables used in the section are the household demographic variables to explain the relationship between meat expenditure patterns and household demographics. Results are shown in the following figures and tables.

Household income:

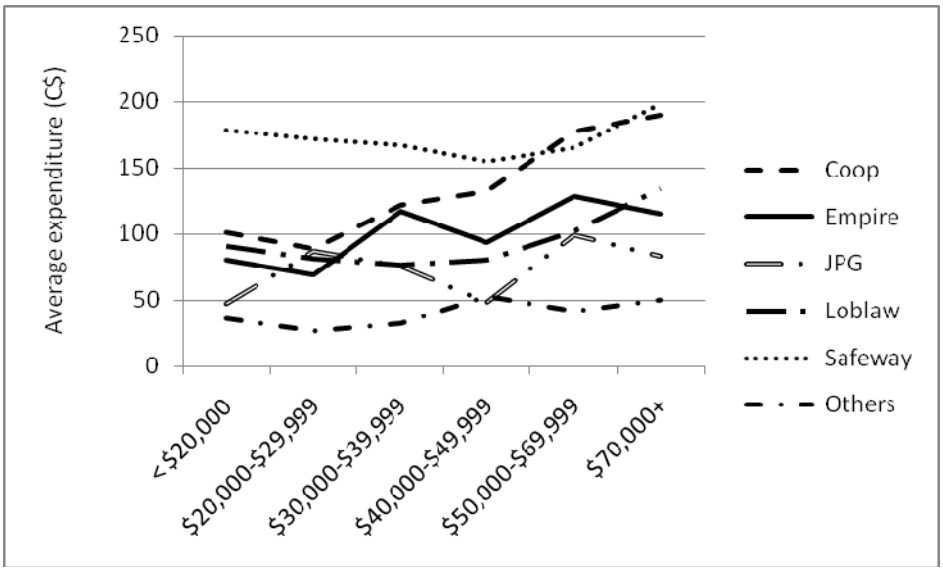
From Figures 5.7 and 5.8, it is noticeable that as household incomes increase, households in Ontario spend more on meat at Loblaw, and less at Metro; consumption at each store chain does not vary much as household incomes increase in Alberta. It also indicates that different income levels vary in impacts on store consumption in both regions.

Figure 5.7 Household incomes and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.8 Household incomes and average annual meat expenditures (C$) in Alberta

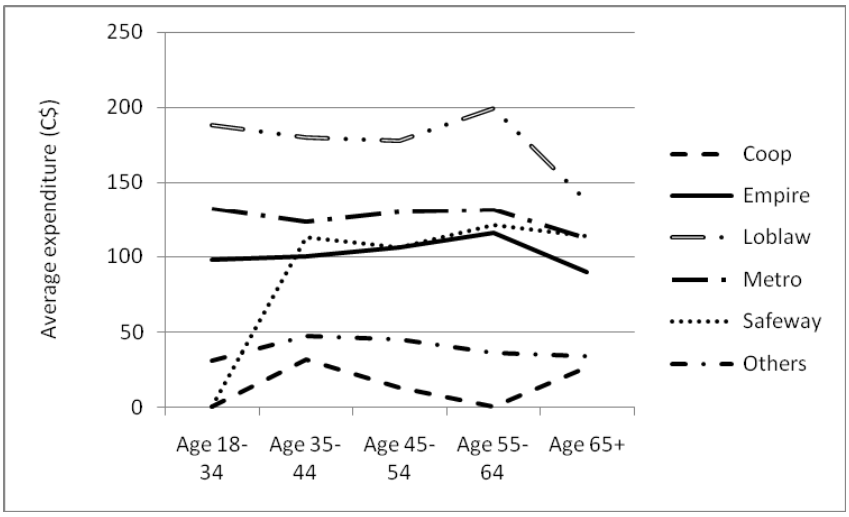


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Household age:

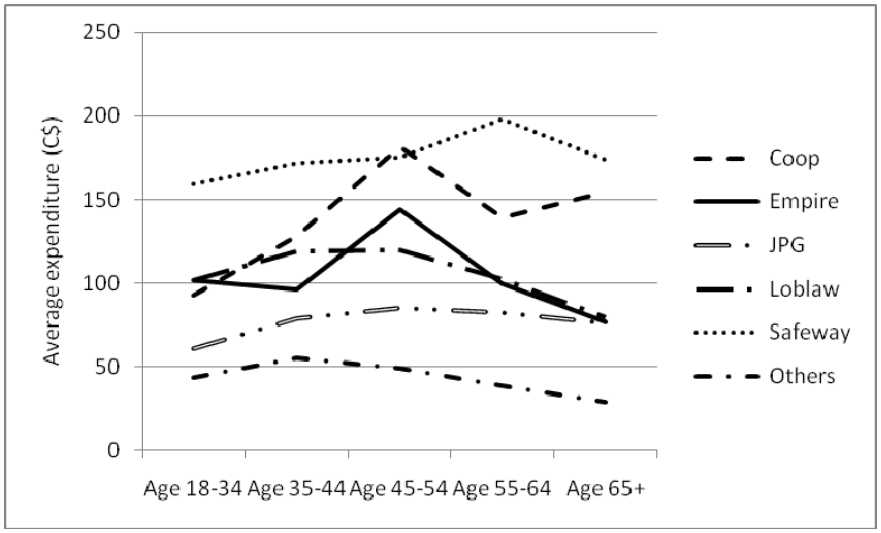
It can be observed from Figures 5.9 and 5.10 that in Alberta average meat expenditures at Safeway are decreasing as household head ages increase.

Figure 5.9 Household head age and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.10 Household head age and average annual meat expenditures (C$) in Alberta

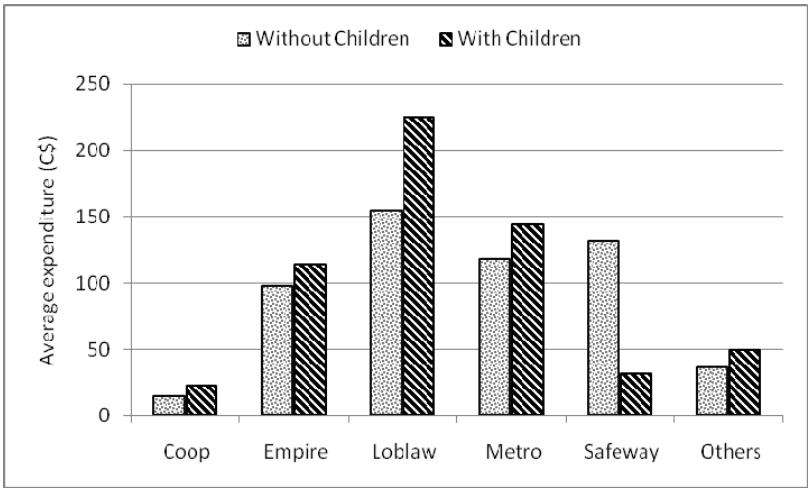


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Presence of children:

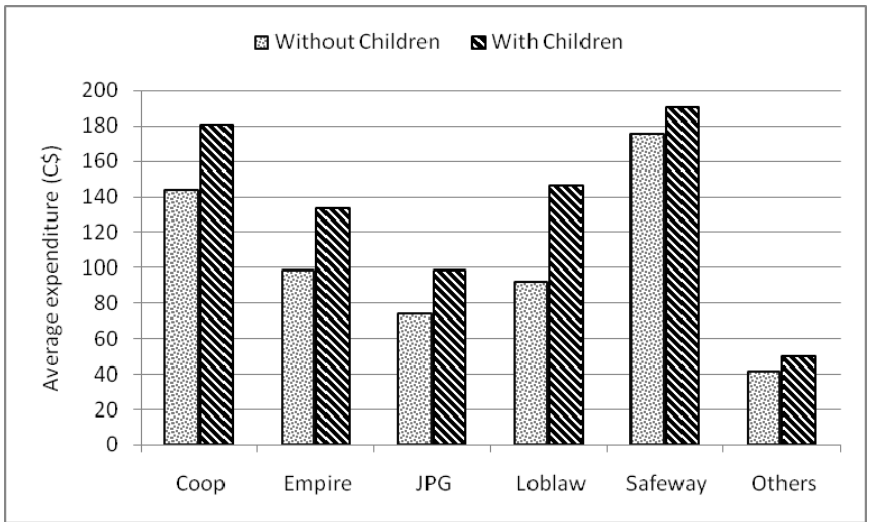
Figures 5.11 and 5.12 show that households with children in Ontario are spending less at Loblaw than those without children. Households in Alberta with children are spending more at all the five grocery chains than those without children.

Figure 5.11 Households with children and average meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.12 Households with children and average meat expenditures (C$) in Alberta

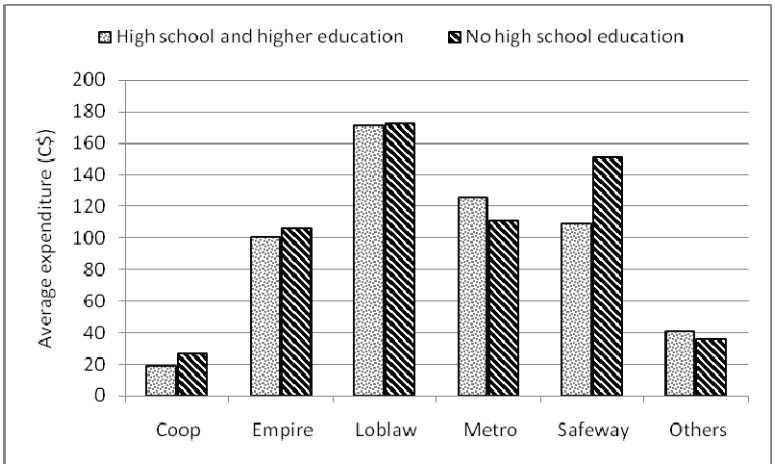


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Education:

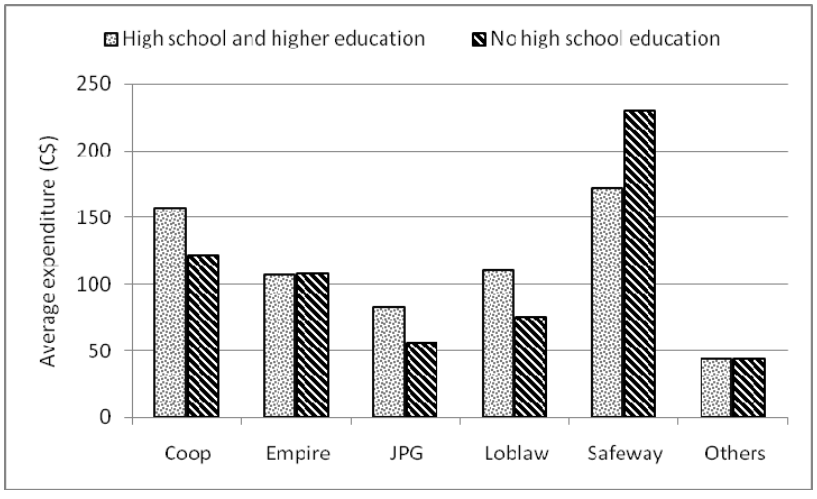
Household head education levels are observed from Figures 5.13 and 5.14 to have little relationship with meat expenditure at Loblaw in Ontario and other chains in Alberta. Household heads with higher education spend more at Co-op, Loblaw and JPG in Alberta than household heads with lower education in Alberta.

Figure 5.13 Household head education and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.14 Household head education and average annual meat expenditures (C$) in Alberta

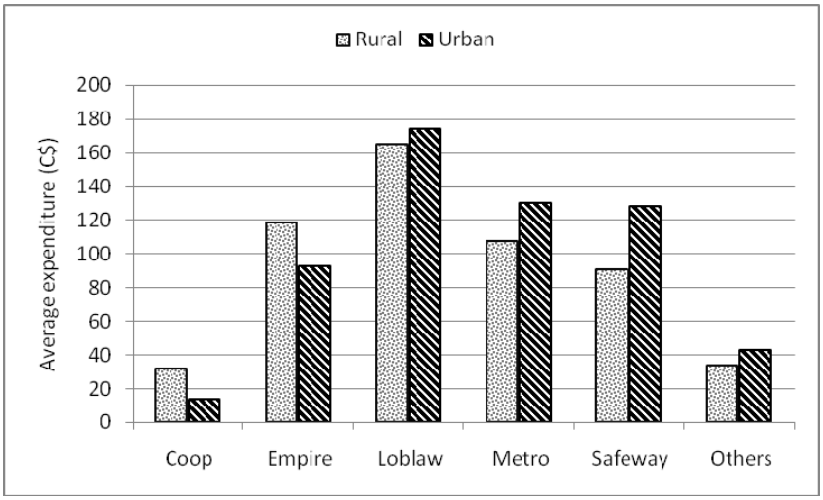


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Urban and Rural:

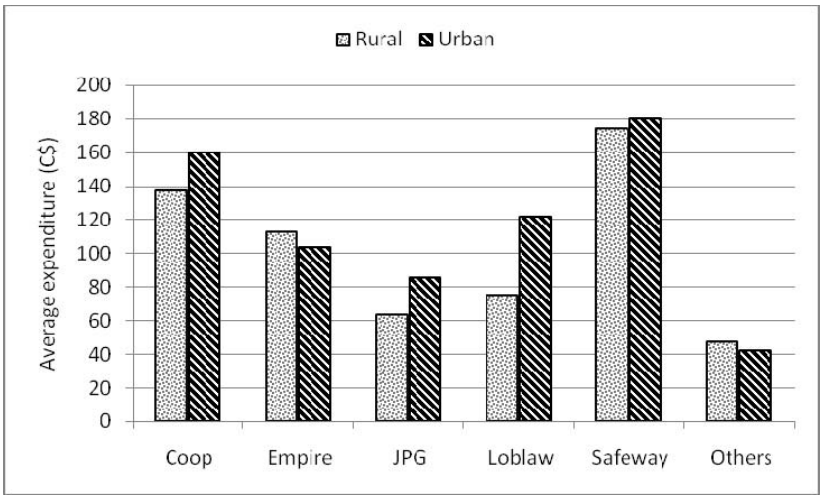
Urban dwellers in Ontario spend more on meat at Metro and Safeway in Ontario and urban dwellers in Alberta are spending more on meat at Co-op, JPG, Loblaw and Safeway.

Figure 5.15 Household residing in urban and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.16 Household residing in urban and average annual meat expenditures (C$) in Alberta

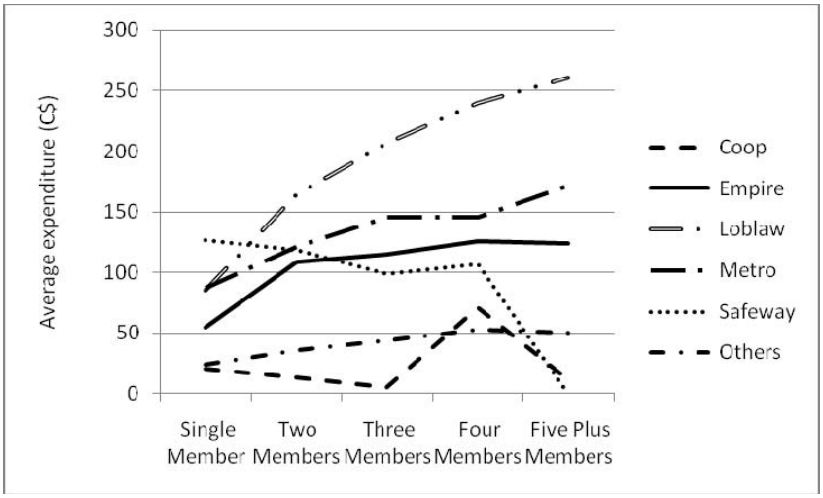


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Household size:

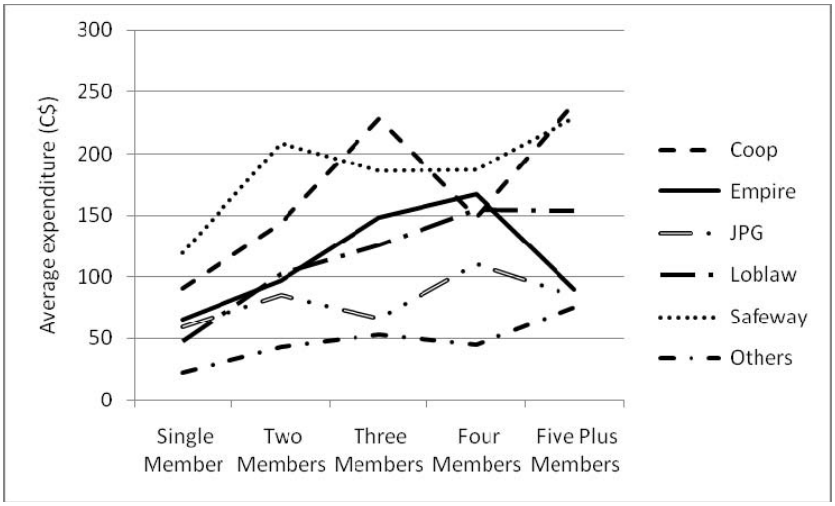
In Ontario, larger households spend more on meat at Loblaw and other grocery store chains. It is noticeable that larger households in Alberta tend to spend more on meat at Loblaw and other chains as well.

Figure 5.17 Household size and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 5.18 Household size and average annual meat expenditures (C$) in Alberta



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

In Tables 5.6 and 5.7 the average store expenditures (Can $) and households with different demographic information in Ontario and Alberta over the period 2002 to 2007 are presented, identifying the similarities and differences in the impact of socioeconomics and household demographics on household meat purchase behaviour.

Table 5.6 Average store expenditures (Can $) and households with different demographic information in Ontario 2002-2007

Demographics	*Co-op*	*Empire*	*Loblaw*	*Metro*	*Safeway*	*Others*
Household income($)						
10000	0	78	97	107	14	25
24999.5	0	82	107	78	82	28
34999.5	23	80	156	101	156	32
44999.5	10	112	169	117	190	32
59999.5	31	108	170	140	92	38
74999.5	10	114	211	144	140	50
Household age						
26	0	98	188	132	0	31
39.5	32	100	180	123	113	47
49.5	13	106	178	130	106	45
59.5	0	116	199	132	121	36
69.5	26	90	138	112	114	34
Children						
Without Children	15	98	155	118	132	36
With Children	23	114	225	144	31	50
Education						
High school & higher	19	101	171	126	109	41
No high school	26	106	172	111	151	36
Residing in						
Rural	32	118	165	108	91	34
Urban	14	92	174	130	128	43
Household size						
Single Member	21	55	85	87	127	24
Two Members	13	108	164	122	118	36
Three Members	5	115	206	146	99	44
Four Members	71	125	240	146	107	53
Five and Over Five	12	124	261	171	0	50

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Table 5.7 Average store expenditures (Can $) and households with different demographic information in Alberta 2002-2007

Demographics	*Co-op*	*Empire*	*JPG*	*Loblaw*	*Safeway*	*Others*
Household income($)						
10000	101	80	48	90	179	36
24999.5	89	69	87	82	172	27
34999.5	122	117	75	77	167	33
44999.5	132	94	48	81	155	53
59999.5	178	128	99	102	165	41
74999.5	190	115	83	134	198	50
Household age						
26	93	102	61	102	160	43
39.5	128	96	79	119	171	56
49.5	181	144	85	120	175	49
59.5	139	100	82	102	198	38
69.5	155	77	76	80	174	29
Children						
Without Children	144	98	74	92	175	42
With Children	180	133	98	146	190	50
Education						
High school & higher	157	107	82	110	171	44
No high school	122	107	56	75	230	44
Residing in						
Rural	137	113	63	75	174	47
Urban	160	103	86	122	180	42
Household size						
Single Member	91	65	60	48	119	22
Two Members	144	97	85	102	209	43
Three Members	228	148	66	126	186	53
Four Members	148	167	110	154	187	45
Five and Over Five	241	89	84	154	229	75

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

5.2.4 Impacts of Store Characteristics

The focus of this study was on the roles of households' socio-demographic variables (e.g. income, household size) in affecting store choice behaviour. As previous studies indicated, store chains' own characteristics can also play an important role in affecting store choice behaviour (Aaker and Jones, 1971; Wrigley, 1988; Alba et al., 1999; Leszczyc et al., 2000; Baltas and Papastathopoulou, 2003; Sinha and Banerjee,

2004; Tripathi and Sinha, 2006; Hui et al., 2009). However due to the data limitation, the store choice estimation in the study does not include the store chains' own characteristics (e.g. store availability, store image, service, store location, average checkout numbers, store sizes, store environment etc.), as ACNielsen Homescan™ panel does not provide such information.

In order to better understand households' store choice behaviour, this section will have a discussion and interpretations of impacts of store characteristics and attributes information provided by reports of *Directory of Retail Chains in Canada 2002-2010* and the annual reports from each grocery store chains (Appendix A: Store Chains and Store Banners).

1. **Loblaw**

As Canada's largest grocery retailer, Loblaw grocery store chains have more than 1,000 corporate and franchised stores in Canada. As shown in Appendix A: Table A.1, the store availability for Loblaw store chains is that there are more than 400 stores located in Ontario in 2009, including major banners of Extra Foods, Fortinos, Loblaws Supermarkets, Lucky Dollar Foods, No Frills, Real Canadian Superstore, Shop Easy Foods, Value Mart, Your independent Grocer, Zehrs. In Alberta, there are more than 90 Loblaw stores, the major banners include Extra Foods, Lucky Dollar Foods, Real Canadian Superstore, Shop Easy Foods, etc..

Store availability has a strong relationship with store expenditure market shares. It is shown in Appendix B Table B.3 that from 2002 to 2007, 89 percent of the Ontario households on average chose to shop at Loblaw chain stores to purchase meat products and 57 percent of the Alberta households chose to shop at Loblaw chain stores. Thus Loblaw has the largest store expenditure share of 49 percent in Ontario, and has 18 percent store expenditure share in Alberta.

The merchandise price categories for Loblaw chains vary from discount to medium, as shown in Table A.1, the location for Loblaw chains varies from shopping centre to street front, for example, the major banners of Extra Foods, No Frills, Real Canadian Superstore, Zehrs usually locate at large shopping centres which indicates they may

not be easily accessed in neighbourhood. The estimation results of the store analysis show that Ontario households with higher incomes and larger household sizes and older Alberta households with higher education are more likely to shop at Loblaw to purchase meat products. It could be explained by the fact that larger households usually choose to shop at larger sized stores which can offer consumers the convenience of one-stop shopping and usually have more product assortment.

2. Metro

Metro is the second largest grocery retailer in Ontario. The major banners include Metro, Super C, A & P, Food Basics. The store availability for Metro shows that there are more than 220 stores located in Ontario in 2009, an average of 73 percent of Ontario households choose to shop at Metro to purchase meat products. Metro chains have 28 percent of the store meat expenditure share in Ontario market. The merchandise price categories for Metro chains vary from discount to medium, as shown in Table A.1. The location for Metro chains varies from shopping centre to street front. The estimation results of the store analysis show that younger Ontario urban dwellers with lower incomes, smaller household sizes and better education are more likely to purchase meat products at Metro, it could be explained by the fact that the price level of the Metro chain is discount or medium which is attractive to the households with lower incomes.

3. Empire (Sobeys)

Sobeys is the second largest food retailer in Canada, as shown in Appendix A. Table A.1, the store availability for Empire store chains is that there are more than 380 stores located in Ontario in 2009, including major banners of Foodland, IGA, Price Chopper and Sobeys. In Alberta, there are more than 110 Empire stores, the major banners include IGA and Sobeys, etc.

Table B.3 in Appendix B shows that from 2002 to 2007, 56 percent of the Ontario households on average chose to shop at Empire chains to purchase meat products and 55 percent of the Alberta households chose to shopped at Empire chains. The store expenditure shares are 18 percent in Ontario and 17 percent in Alberta. The

merchandise price categories for Empire chains vary from discount to medium - upper, as shown in Table A.1. The location for Empire chains varies from shopping centre to street front. The estimation results of the store analysis show that rural dwellers in Ontario with lower incomes and educations are more likely to purchase meat products at Empire, and in Alberta younger rural dwellers with lower education are more likely to purchase at Empire store chains.

4. JPG (Save-On-Foods)

JPG (Save-On-Foods) has a store availability of 24 stores in Alberta, and is not available in Ontario. The first store in the chain opened in Canada in 1982. Table B.3 in Appendix B shows that from 2002 to 2007, 27 percent of Alberta households on average chose to shop at JPG chains to purchase meat products, and JPG has a store expenditure share of 6 percent in the Alberta retailing market. The merchandise price category for Metro chains is medium level. The location for JPG store chains are at shopping centre areas. The estimation results of the store analysis show that younger rural dwellers in Alberta with lower education are more likely to shop at JPG.

5. Co-op

The Co-op store availability in Ontario is limited which results in the fact that few households in Ontario shopped at Co-op. Thus the Co-op chains have a very small market share in Ontario. In Alberta, Co-op has more than 30 stores in Alberta areas, and 27 percent of the Alberta households choose to shop at Co-op store chains.

The merchandise price categories for Co-op chains vary from discount to medium level, as shown in Table A.1. The location for Co-op chains varies from shopping centre to street front. The estimation results of the store analysis show that older Alberta households with better education and large household sizes are more likely to shop at Co-op stores, this could be explained by the tradition store availability in Alberta, older households are familiar with Co-op and have some store loyalty.

6. Safeway

Safeway grocery store chains are one of the largest food and drug retailers in North America. Canada Safeway store chains have 6 stores in Ontario and more than 90 stores in Alberta in 2009. Table B.3 in Appendix B presents that from 2002 to 2007, 70 percent of the Alberta households on average chose to shop at Safeway chains to purchase meat products, and Safeway has a store expenditure share of 38 percent in the Alberta retailing market. Due to the limited store availability in Ontario, Safeway has a very small store expenditure share in Ontario.

The merchandise price category for Safeway chains is at the medium level, as shown in Table A.1. The location for Safeway chains varies from shopping centre to street front. The estimation results of the store analysis indicate that younger urban dwellers in Alberta with smaller household sizes and lower education, this could be explained by the store location availability of Safeway.

5.2.5 Sample Data Statistics

Some statistics of the sample and variable definitions are shown in Table 5.8 for both Alberta and Ontario. For the first Probit model, binary dependent variables (PCOOP, PEMP, PLOB PMET, PJPG PSAFE, POTH, definitions in Table 5.8) are one if the household made meat purchases at each store and zero otherwise.

Table 5.8 Definition and sample statistics of variables in store choice analysis

Variables	Definitions	Ontario		Alberta	
		Mean	**SD**	**Mean**	**SD**
First stage binary dependent variables					
PCOOP	1 if choose Co-op, 0 otherwise	**0.003**	*0.052*	**0.374**	*0.484*
PEMP	1 if choose Sobeys(empire), 0 otherwise	**0.564**	*0.496*	**0.547**	*0.498*
PLOB	1 if choose Loblaw, 0 otherwise	**0.886**	*0.317*	**0.574**	*0.495*
PMET	1 if choose Metro, 0 otherwise	**0.734**	*0.442*	**N/A**	*N/A*
PJPG	1 if choose Save on foods(JPG), 0 otherwise	**N/A**	*N/A*	**0.268**	*0.443*
PSAFE	1 if choose Safeway, 0 otherwise	**0.009**	*0.097*	**0.700**	*0.458*
POTH	1 if choose other stores, 0 otherwise	**0.399**	*0.490*	**0.375**	*0.484*
Second stage expenditure share dependent variables					
COOPSH	store expenditure share of Co-op	**0.001**	*0.017*	**0.165**	*0.296*
EMPSH	store expenditure share of Sobeys	**0.174**	*0.260*	**0.162**	*0.262*
LOBSH	store expenditure share of Loblaw	**0.455**	*0.343*	**0.191**	*0.283*
METROSH	store expenditure share of Metro	**0.294**	*0.314*	**N/A**	*N/A*
JPGSH	store expenditure share of Save on foods	**N/A**	*N/A*	**0.078**	*0.201*
SAFESH	store expenditure share of Safeway	**0.004**	*0.054*	**0.339**	*0.358*
OTHSH	store expenditure share of others	**0.072**	*0.165*	**0.065**	*0.156*
Logged form of meat expenditure					
LCOOP	logged store expenditure of Co-op	**0.003**	*0.064*	**0.730**	*1.010*
LEMP	logged store expenditure of Sobeys	**0.969**	*0.962*	**0.942**	*0.973*
LLOB	logged store expenditure of Loblaw	**1.796**	*0.840*	**1.024**	*0.986*
LMET	logged store expenditure of Metro	**1.356**	*0.958*	**N/A**	*N/A*
LJPG	logged store expenditure of Save on foods	**N/A**	*N/A*	**0.435**	*0.783*
LSAFE	logged store expenditure of Safeway	**0.018**	*0.191*	**1.410**	*1.058*
LOTH	logged store expenditure of others	**0.562**	*0.751*	**0.549**	*0.762*
TEXP	Total expenditure on all stores	**385**	*325*	**416**	*338*
LTE	logged total exp on all stores	**5.579**	*0.968*	**5.670**	*0.955*
HH demographic and purchase information					
HHINC	Annual HH income (10K C$, midpoint)	**5.24**	*2.21*	**5.19**	*2.19*
HAGE	Household head age (midpoint)	**55**	*12*	**53**	*12*
HAGES	Squared household head age (midpoint)	**3212**	*1281*	**3006**	*1272*
KID1	1 if HH with children, 0 otherwise	**0.223**	*0.416*	**0.222**	*0.416*
KID0	1 if HH without children, 0 otherwise	**0.777**	*0.416*	**0.778**	*0.416*
HHEDU0	1 if no high school edu, 0 otherwise	**0.140**	*0.347*	**0.130**	*0.336*
HHEDU1	1 if higher edu, 0 otherwise	**0.860**	*0.347*	**0.870**	*0.336*
URBAN	1 if in urban area, 0 otherwise	**0.685**	*0.465*	**0.685**	*0.465*
RURAL	1 if in rural area, 0 otherwise	**0.315**	*0.465*	**0.315**	*0.465*
HHSIZE	Number of members in household	**2.397**	*1.210*	**2.337**	*1.209*
T	year 1-6	**3.500**	*1.708*	**3.500**	*1.708*
CHAINS	Number of grocery chains HH shopped at	**2.596**	*0.894*	**2.839**	*1.175*

Table 5.8 continued...

Variables	Definitions	Ontario		Alberta	
		Mean	SD	Mean	SD
Advertising expenditure by grocery store chains (Millions Can $)					
TA1COOP	One year lag of AD for Co-op	**1.90**	*6.53*	**1.90**	*6.53*
TA1EMP	One year lag of AD for Sobeys	**8.60**	*1.00*	**8.60**	*1.00*
TA1LOB	One year lag of AD for Loblaw	**9.55**	*0.93*	**9.55**	*0.93*
TA1MET	One year lag of AD for Metro	**5.51**	*0.96*	**N/A**	*N/A*
TA1JPG	One year lag of AD for Save on foods	**N/A**	*N/A*	**4.71**	*1.91*
TA1SAFE	One year lag of AD for Safeway	**14.16**	*2.68*	**14.16**	*2.68*
TA1OTH	One year lag of AD for othes	**27.28**	*3.30*	**28.07**	*1.44*

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007 and Nielsen Media Measurement™ national advertising data, 2002-2007.

For the second Working-Leser demand system, meat expenditure shares by store are the dependent variables (COOPSH, EMPSH, LOBSH, METSH, JPGSH, SAFESH, OTHSH). For Ontario, average store meat expenditure shares for Co-op, Empire, Loblaw, Metro, Safeway and other stores were 0.01, 0.17, 0.46, 0.29, 0.01, and 0.07 respectively. For Alberta, average store meat expenditures for Co-op, Empire, Loblaw, JPG, Safeway and other stores were 0.17, 0.17, 0.19, 0.08, 0.34 and 0.07, respectively. Household demographic information and one year lagged store advertising expenditures are also presented in the table.

5.3 Model Structure and Model Specification

The source of data used in the store choice analysis is the same balanced panel of sample data that is used in the meat choice analysis in the previous section. Due to the zero consumption problems, not all households in Ontario and Alberta have positive expenditures at all six grocery chains in each period. It is assumed that each household faces a two-step hierarchy in decision making: households first make the decision of where to shop (participation step), then they will decide how much to spend on meat in the chosen grocery store once they have made the store choice decision (expenditure step).

Therefore a two-step estimation procedure following the Heien and Wessels (1990) Working-Leser demand system procedure is applied in the store choice demand analysis. In the first step, a Probit regression is computed to determine the probability that a given household will shop at each grocery store. The probability of participation is then used as an instrument in the second-stage estimation of the Working-Leser demand system.

(1) Participation Decision for Grocery Stores (Where to Shop)

The first stage of the demand system is modeled as a participation choice problem: the dependent variable is represented by a binary choice variable $y_{iht} = 1$ if household *h* decides to shop at a given grocery store *i* at period *t* and is $y_{iht} = 0$ if the household does not choose to shop at period *t*. Then given $E(y_{iht}) = 1 * p_{iht} + 0 * (1 - p_{iht}) = p_{iht}$, followed by the same method as in Chapter 4, the grocery store participation decision is modeled as a function of household demographic variables, total meat expenditure and advertising expenditure in all grocery stores.

So the likelihood of household grocery store participation decision ($\Pr[y_{iht} = 1]$) can be expressed a:

$$\Pr[y_{iht} = 1] = \Pr[X_{iht}^{t}\beta + a_{iht} + \varepsilon_{ih} > 0] = \phi(X_{iht}^{t}\beta)$$

and the likelihood of households that do not shop at a given grocery store is:

$$\Pr[y_{iht} = 0] = \Pr[X_{iht}^{t}\beta + a_{iht} + \varepsilon_{ih} = 0] = 1 - \phi(X_{iht}^{t}\beta)$$

where

$$X_{iht}^{t}\beta = \beta_0 + \beta_1 * \mathrm{Texp} + \beta_2 * hhinc + \beta_3 * hage + \beta_4 * hhedu1 + \beta_5 * kid1$$
$$+\beta_6 * hhsize + \beta_7 * T + \beta_8 * chains + \beta_9 * urban + \beta_{10} * AD + \beta_{11} * ADoth$$

(2) Expenditure Decision for Grocery Stores (How Much to Spend)

The second step is the estimation of the store expenditure share equations of the Working-Leser demand system via seemingly unrelated regressions (SUR) of the expenditure shares that household h spends in a given grocery store i in time period t. In the Working-Leser model, each store expenditure share is a linear function of the log of the total expenditure in all grocery store chains and household demographic variables, lagged store advertising variables. The general form of the second stage equations of Working-Leser demand function can be expressed as[5]:

$$\omega_i = a_0 + a_1 * \log(T\exp) + a_2 * hage + a_3 * \log[M_i(-1)] + a_4 * Mills + a_5 * hhedu$$
$$+a_6 * \mathrm{hhinc} + a_7 * KID + a_8 * urban + a_9 * hhsize + a_{10} * AD + a_{11} * ADoth$$
$$+a_{12} * chains + a_{13} * T + \varepsilon_{it}$$

[5] The definitions of each variable in the model are listed in Table 5.8.

5.4 Model Testing and Estimation Results

Time Series Processing (TSP) version 5.0 was used as the econometric software for the estimation of the two-stage Working-Leser demand system, the same as the meat choice analysis in the previous chapter. Estimations were performed respectively for Alberta and Ontario using the balanced panel data from 2002 to 2007. A two-step estimation following the Heien and Wessels (1990) Working-Leser demand system procedure is applied in the store choice demand analysis. In the first step, a Probit regression is computed to determine the probability that a given household will purchase at a particular store chain. The probability of store purchase is then used as an instrument in the second-stage estimation of the Working-Leser demand system.

5.4.1 Store Purchase Participation Decision Results for Ontario and Alberta

The first stage Probit models for Ontario and Alberta estimation results are reported in Tables 5.9 and 5.10 below. The statistical significance in the inclusion of explanatory variables in each Probit model was examined with a likelihood ratio test with the null hypothesis that all slope coefficients were zero. Therefore all the variables used in the Probit regressions for the first stage of participation decision were statistically significant in aggregate, many of the coefficients were significant at the 1 percent level. For Ontario, the generalized goodness of fit measure, scaled R-squared values, for Co-op, Empire, Loblaw, Metro, Safeway and other stores were 0.01, 0.36, 0.16, 0.30, 0.01, 0.40 respectively. The prediction accuracies for Co-op, Loblaw and Safeway were higher than 90 percent, prediction accuracies for Empire, Metro and other stores were around 80 percent. For Alberta, the scaled R-squared values for Co-op, Empire, Loblaw, JPG, Safeway and other stores were 0.06, 0.34, 0.29, 0.12, 0.30 and 0.29, respectively. The overall prediction accuracies were a bit lower than those in Ontario. For store chains in Alberta, prediction accuracy ranged from 65.3 percent for Co-op to 78.1 percent for Safeway. Marginal effects for independent variables for each meat product are reported in Tables 5. 11 and 5.12

Table 5.9 First-Step Probit Estimates for Ontario

Variables	Co-op		Empire		Loblaw		Metro		Saefway		Others	
	Coeff.	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*
Constant	-3.103	[2.263]	-2.201***	[0.491]	-2.323***	[0.764]	-1.274*	[0.739]	-3.975*	[2.264]	-3.354***	[0.507]
TEXP	-0.001*	[0.001]	0.001***	[6.2E-05]	0.001***	[9.7E-05]	1.6E-06	[6.3E-05]	-2.8E-04	[2.0E-04]	-0.001***	[6.9E-05]
HHINC	0.021	[0.049]	-0.021**	[0.009]	0.029**	[0.012]	-0.028***	[0.010]	-0.011	[0.026]	0.030***	[0.010]
HAGE	-0.012	[0.009]	0.004**	[0.002]	0.003	[0.002]	-0.001	[0.002]	-0.004	[0.005]	-0.004**	[0.002]
HHEDU1	0.116	[0.324]	0.003	[0.055]	-0.073	[0.076]	0.191***	[0.059]	-0.026	[0.144]	-0.130**	[0.056]
KID1	0.262	[0.290]	-0.026	[0.067]	0.016	[0.094]	0.025	[0.071]	-0.218	[0.182]	-0.037	[0.068]
T	-0.113	[0.133]	-0.006	[0.031]	-0.090**	[0.038]	-0.029	[0.029]	0.016	[0.083]	0.133***	[0.036]
URBAN	0.085	[0.204]	-0.301***	[0.041]	-0.113**	[0.053]	0.271***	[0.042]	-0.059	[0.106]	0.164***	[0.042]
CHAINS	0.352***	[0.107]	1.060***	[0.026]	0.773***	[0.032]	1.027***	[0.028]	0.028	[0.057]	1.105***	[0.028]
HHSIZE	-0.011	[0.110]	-0.053**	[0.024]	0.026	[0.032]	-0.163***	[0.025]	0.046	[0.063]	0.191***	[0.025]
AD	0.039	[0.180]	0.009	[0.018]	0.061*	[0.032]	-0.012-08	[0.041]	-0.045	[0.041]	-0.043*	[0.024]
AD-OTH	0.002	[0.038]	-0.004	[0.009]	0.019*	[0.011]	-0.003-09	[0.011]	0.047	[0.052]	0.017	[0.018]
Regression statistics												
Schwarz B.I.C.	155.184		3127.64		1759.95		2701.29		382.264		2906.95	
Log likelihood	-102.775		-3075.23		-1707.54		-2648.88		-329.855		-2854.54	
LR (zero slopes)	29.06 [.000]		2364.54 [.000]		984.99 [.000]		1902.41 [.000]		7.29 [.775]		2655.03 [.000]	
Scaled R2	0.005		0.360		0.164		0.299		0.001		0.402	
Predictions	99.7%		75.3%		89.4%		79.2%		99.1%		77.7%	

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

Table 5.10 First-Step Probit Estimates for Alberta

Variables	Co-op		Empire		Loblaw		JPG		Saefway		Others	
	Coeff.	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*	*Coeff.*	*SE*
Constant	-1.482**	[0.623]	-1.384**	[0.689]	-2.026**	[0.793]	-1.532**	[0.703]	-2.592**	[1.303]	-2.068***	[0.711]
TEXP	-4.5E-06	[7.7E-05]	2.2E-04**	[8.8E-05]	-1.7E-05	[8.7E-05]	-2.6E-04***	[8.3E-05]	0.001***	[1.0E-04]	-4.4E-04***	[8.6E-05]
HHINC	-0.023*	[0.012]	-0.025*	[0.013]	0.020	[0.013]	0.012	[0.013]	0.002	[0.014]	0.023*	[0.013]
HAGE	0.009***	[0.002]	0.630	[0.002]	-0.002	[0.002]	-0.001	[0.002]	0.001	[0.003]	-0.010***	[0.002]
HHEDU1	0.039	[0.073]	-0.137*	[0.081]	0.022	[0.081]	0.190**	[0.084]	-0.185**	[0.085]	0.025	[0.081]
KID1	-0.158*	[0.090]	0.080	[0.098]	0.028	[0.097]	0.154	[0.097]	0.198*	[0.103]	-0.253***	[0.097]
T	-0.019	[0.037]	0.023	[0.044]	0.019	[0.040]	0.017	[0.060]	-0.118**	[0.047]	0.101**	[0.042]
URBAN	-0.162***	[0.052]	-0.497***	[0.058]	-0.219***	[0.056]	0.203***	[0.058]	0.974***	[0.058]	-0.308***	[0.056]
CHAINS	0.223***	[0.021]	0.741***	[0.028]	0.684***	[0.026]	0.425***	[0.024]	0.585***	[0.028]	0.656***	[0.027]
HHSIZE	0.116***	[0.032]	-1.6E-04	[0.035]	0.006	[0.035]	-0.090**	[0.035]	-0.262***	[0.037]	0.170***	[0.035]
AD	0.074	[0.048]	0.011	[0.026]	0.019	[0.033]	-0.040	[0.041]	-0.015	[0.021]	0.010	[0.020]
AD-OTH	-0.002	[0.011]	-0.004	[0.013]	0.004	[0.012]	-0.005	[0.012]	0.038	[0.029]	-0.010	[0.014]
Regression statistics												
Schwarz B.I.C.	1969.96		1593.76		1659.62		1635		1445.83		1599.57	
Log likelihood	-1921.82		-1545.63		-1611.49		-1586.87		-1397.7		-1551.44	
LR (zero slopes)	187.19 [.000]		1107.29 [.000]		935.17 [.000]		369.89 [.000]		927.76 [.000]		930.01 [.000]	
Scaled R2	0.061		0.344		0.294		0.120		0.295		0.293	
Predictions	65.2%		73.8%		73.4%		75.2%		78.4%		73.8%	

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

Table 5.11 Marginal Effects for Probit Estimates, Ontario

	Co-op		**Empire**		**Loblaw**		**Metro**		**Saefway**		**Others**	
Variables	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***
Constant	-0.014	[0.187]	-0.839***	[0.300]	-0.290***	[0.142]	-0.351*	[0.339]	-0.106*	[0.215]	-1.228***	[0.252]
TEXP	-3.6E-06*	[1.1E-05]	9.0E-05***	[1.6E-05]	8.9E-05***	[8.5E-06]	4.4E-07	[1.1E-05]	-0.0000076	[1.4E-05]	-2.4E-04***	[1.8E-05]
HHINC	0.001	[0.001]	-0.009**	[0.002]	0.004**	[0.001]	-0.008***	[0.002]	-0.003	[0.001]	0.011***	[0.002]
HAGE	-0.000055	[2.2E-04]	0.001**	[4.4E-04]	0.00039	[2.0E-04]	-0.00016	[3.5E-04]	-0.0001	[2.3E-04]	-0.001**	[4.9E-04]
HHEDU1	0.001	[0.007]	0.001	[0.013]	-0.009	[0.007]	0.052***	[0.011]	-0.001	[0.005]	-0.048**	[0.014]
KID1	0.001	[0.007]	-0.01	[0.017]	0.002	[0.010]	0.007	[0.014]	-0.006	[0.007]	-0.014	[0.019]
T	-0.001	[0.007]	-0.002	[0.019]	-0.011**	[0.007]	-0.008	[0.013]	0.001	[0.008]	0.049***	[0.019]
URBAN	0.001	[0.003]	-0.115***	[0.010]	-0.014**	[0.004]	0.075***	[0.007]	-0.002	[0.005]	0.060***	[0.010]
CHAINS	0.002***	[0.004]	0.404***	[0.010]	0.097***	[0.003]	0.283***	[0.005]	0.001	[0.003]	0.404***	[0.012]
HHSIZE	-0.001	[0.003]	-0.020**	[0.006]	0.003	[0.003]	-0.045***	[0.005]	0.001	[0.004]	0.070***	[0.006]
AD	0.002	[0.009]	0.004	[0.001]	0.008*	[0.006]	-0.003	[0.002]	-0.001	[0.003]	-0.002*	[0.001]
AD-OTH	0.001	[0.001]	-0.002	[0.006]	0.002*	[0.002]	-0.001	[0.004]	0.001	[0.004]	0.006	[0.009]

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

Table 5.12 Marginal Effects for Probit Estimates, Alberta

	Co-op		Empire		Loblaw		JPG		Saefway		Others	
Variables	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***	***Coeff.***	***SE***
Constant	-0.548**	[0.544]	-0.532**	[0.399]	-0.766**	[0.475]	-0.476**	[0.420]	-0.800**	[0.679]	-0.745***	[0.350]
TEXP	-0.001	[1.7E-05]	8.4E-05**	[2.3E-05]	-0.0000066	[2.4E-05]	-8.0E-05***	[1.4E-05]	1.9E-04***	[2.0E-05]	-1.6E-04***	[2.3E-05]
HHINC	-0.009*	[0.003]	-0.010*	[0.004]	0.007	[0.003]	0.004	[0.002]	0.001	[0.003]	0.008*	[0.004]
HAGE	0.003***	[4.9E-04]	0.000024	[0.001]	-0.001	[0.001]	-0.00019	[4.2E-04]	0.00035	[0.001]	-0.004***	[0.001]
HHEDU1	0.015	[0.015]	-0.053*	[0.019]	0.008	[0.023]	0.059**	[0.016]	-0.057**	[0.017]	0.009	[0.022]
KID1	-0.059*	[0.019]	0.031	[0.028]	0.011	[0.024]	0.048	[0.018]	0.061*	[0.022]	-0.091***	[0.027]
T	-0.007	[0.032]	0.009	[0.025]	0.007	[0.025]	0.005	[0.037]	-0.036**	[0.025]	0.037**	[0.021]
URBAN	-0.060***	[0.010]	-0.191***	[0.014]	-0.083***	[0.013]	0.063***	[0.011]	0.300***	[0.011]	-0.111***	[0.014]
CHAINS	0.083***	[0.005]	0.285***	[0.010]	0.259***	[0.009]	0.132***	[0.006]	0.181***	[0.006]	0.236***	[0.011]
HHSIZE	0.043***	[0.007]	-0.000062	[0.009]	0.002	[0.009]	-0.028**	[0.007]	-0.081***	[0.008]	0.061***	[0.010]
AD	0.028	[0.039]	0.004	[0.015]	0.007	[0.021]	-0.012	[0.024]	-0.005	[0.011]	0.004	[0.010]
AD-OTH	-0.001	[0.009]	-0.002	[0.008]	0.002	[0.007]	-0.001	[0.007]	0.012	[0.015]	-0.004	[0.007]

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively; [values in square brackets are standard errors].

In Ontario it can be observed from the marginal effect results that Ontario households who spend more on total meat were more likely to shop at Empire and Loblaw store chains, and were less likely to shop at Co-op and other stores. Urban dwellers with lower incomes and smaller household sizes were more likely to purchase meat products at Metro. The number of store chains that a household shopped at was statistically significant for all store chains in Ontario (except for Safeway), suggesting that the more store chains that a household shopped at, the higher the probability that those store chains, for example, Empire, Loblaw, and Metro would be chosen. Over time more households were choosing to purchase meat at other stores and a decreasing number of households were choosing Loblaw. This may be explained by the fact that more new grocery store chains are entering the market, which was attractive to the households in Ontario and those new grocery store chains were gaining market share from Loblaw. The variable for households with presence of children had no statistically significant impacts on the store choices. Older aged household heads were more likely to purchase at Empire and less at other stores. Own store advertising expenditures have positive and statistically significant effects on choosing Loblaw and negative effects for other stores.

As compared to households in Ontario, Alberta households who had higher meat expenditure levels spent more money at Empire and Safeway. Alberta urban dwellers were less likely to purchase meat at Co-op, Empire, Loblaw and other stores but more likely to make meat purchases at JPG and Safeway. Larger household sizes represented an increased probability of purchasing meat at Co-op and other grocery stores in Alberta. Over time more households were choosing other stores, indicating that other grocery chains were gaining market share. The number of store chains that a household shopped at was statistically significant for all store chains in Alberta suggesting that the more store chains that the household shopped at, the higher probability that those store chains would be chosen.

5.4.2 Store Expenditure Decision Results for Ontario and Alberta

In order to select the best fitting model for the second stage Working-Leser demand system analysis, the same testing procedure as in the previous chapter was conducted using the basic models but restricting the coefficients. Likelihood ratio tests (LRT) were conducted to select the inclusion of variables in the best fitting model. A likelihood ratio test is a statistical test which compares the goodness-of-fit between unrestricted and restricted models. The LRT is valid only when the models to be tested against each other are hierarchically nested. The objective criterion of likelihood ratio test ($\lambda_{LR} = 2\left[\ln(L)_u - \ln(L)_r\right]$) is the Chi-square statistic. The degree of freedom is equal to the number of additional parameters in the unrestricted model. If the likelihood ratio statistic of LRT ($\lambda_{LR} = 2\left[\ln(L)_u - \ln(L)_r\right]$) is significantly greater than the critical value (Chi-square statistic), then the unrestricted model is preferred by the LRT test (Greene, 2003).

The likelihood ratios estimated from the unrestricted and restricted models for store choice analysis are presented in Tables 5.13 and 5.14. For the Ontario store choice model, the null hypotheses that total meat expenditure, inverse mills ratio (selection bias from first Probit model), one year lagged store expenditure, urban, household education, household income, household size, and household head age have no effect on meat expenditure shares (at 10 percent significance level) are rejected. The null hypotheses that time trend and households with presence of children variables have no effect on meat expenditure shares are not rejected (at 10 percent significance level). Thus, examination using LRT test indicates that all the variables except for time trend and households with presence of children variables should be retained in the final Working-Leser demand system (at 10 percent significance level).

Table 5.13 Log-likelihood ratio test results for Ontario model specification

Model	Log-likelihood	LR test statistics
Original	31061.7	
Restricting		
hhinc	31023.0	77.5***
hage	31055.1	13.2**
T	31058.9	5.5
KID1	31057.7	7.9
HHEDU1	31046.7	30.0***
CHAINS	30603.9	915.6***
hhsize	31012.1	99.2***
urban	31024.7	74.1***
EXP(-1)	30023.1	2077.2***
IMR	27764.7	6594.1***

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively
Chi-square(5) critical values are 15.09(1%), 11.07 (5%) and 9.24 (10%).

For the Alberta second stage store choice model, the null hypotheses that total meat expenditure, inverse mills ratio (selection bias from first Probit model), number of store chains shopped at by a household, urban, households with presence of children, household head age, household education, and household size have no effect on meat expenditure shares (at 10 percent significance level) are rejected. The null hypotheses that household income and time trend have no effect on meat expenditure shares are not rejected (at 10 percent significance level). Thus, those variables were omitted from the final Working-Leser demand system for Alberta. The specifications for both Ontario and Alberta had some similarities and some differences. Total meat expenditure, inverse mills ratio (selection bias from the first stage Probit model), urban, number of store chains that a household shopped at, household education, and household size all had statistically significant impacts on stores shares of meat expenditure (at 10 percent significance level). Time trend had statistically insignificant impacts on stores shares (at 10 percent significance level).

Table 5.14 Log-likelihood ratio test results for Alberta model specification

Model	Log-likelihood	LR test statistics
Original	5253.3	
Restricting		
hhinc	5249.4	7.8
hage	5235.9	34.6***
T	5251.7	3.1
KID1	5246.6	13.4**
HHEDU1	5228.6	49.3***
CHAINS	4881.4	743.8***
hhsize	5197.6	111.4***
urban	5188.3	130.0***
EXP(-1)	4422.3	1662.0***
IMR	4060.3	2385.9***

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively
Chi-square (5) critical values are 15.09(1%), 11.07 (5%) and 9.24 (10%).

Because of the adding-up restrictions, the equations for other stores were omitted in estimation of both the Ontario and the Alberta store choice models. The parameters of the other stores equations were obtained from the rest of the equations in the demand system from system adding-up restrictions. The estimation procedure was using the LSQ command in Time Series Processing (TSP) version 5.0 with iterative seemingly unrelated regressions (SUR). The estimated parameters for the Working-Leser demand system of both regions are presented in Tables 5.15 and 5.16. For Ontario, the goodness of fit measure, R-squared values, for Co-op, Empire, Loblaw, Metro, Safeway and Others were: 0.27, 0.52, 0.51, 0.52, and 0.74, respectively. For Alberta, the goodness of fit measure, R-squared values, for Co-op, Empire, Loblaw, JPG, Safeway and Others were: 0.68, 0.55, 0.58, 0.56, and 0.62, respectively. Other goodness of fit statistics, Durbin-Watson statistics, AIC, BIC and log likelihood values are also presented in Table 5.15 and Table 5.16.

Table 5.15 Second-Step Working-Leser Model Estimates for Ontario

Variables	Co-op		Empire		Loblaw		Metro		Safeway		Others	
	Coeff.	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*
CONSTANT	**0.006****	[2.318]	**0.240*****	[6.367]	**0.208*****	[3.429]	**0.483*****	[6.577]	**0.003**	[0.130]	**0.059**	[0.719]
TOTAL EXP	**-0.001*****	[-2.990]	**-0.011*****	[-3.563]	**0.019*****	[4.355]	**-0.016*****	[-4.326]	**-0.001**	[-0.462]	**0.009*****	[2.606]
HHINC	**0.001**	[0.988]	**-0.005*****	[-3.908]	**0.006*****	[3.555]	**-0.009*****	[-5.171]	**-0.001**	[-1.133]	**0.007*****	[6.945]
HAGE	**-0.001**	[-1.118]	**0.001**	[0.642]	**0.001**	[0.751]	**-0.001****	[-2.265]	**-0.001***	[-1.831]	**0.001***	[1.843]
HHEDU1	**0.001**	[0.273]	**-0.027*****	[-3.510]	**-0.012**	[-1.172]	**0.046*****	[4.805]	**0.001**	[0.745]	**-0.007**	[-1.149]
CHAINS	**0.001**	[0.328]	**0.024*****	[7.785]	**-0.096*****	[-23.498]	**0.006**	[1.485]	**-0.001**	[-1.575]	**0.067*****	[24.478]
HHSIZE	**-0.001**	[-0.828]	**-0.004**	[-1.473]	**0.012*****	[3.438]	**-0.029*****	[-9.162]	**-0.001****	[-2.450]	**0.022*****	[9.886]
IMR	**0.051*****	[36.817]	**0.139*****	[42.489]	**0.156*****	[34.160]	**0.148*****	[38.526]	**0.135*****	[56.886]	**-0.629*****	[-18.361]
URBAN	**0.001**	[0.105]	**-0.037*****	[-6.572]	**-0.013***	[-1.731]	**0.044*****	[6.248]	**-0.002****	[-2.069]	**0.009****	[1.985]
LAGGED EXP	**0.013*****	[4.582]	**0.070*****	[28.227]	**0.091*****	[28.015]	**0.071*****	[26.346]	**0.075*****	[22.080]	**-0.320*****	[-8.426]
AD	**-0.001**	[-1.207]	**0.006****	[2.037]	**0.011*****	[3.575]	**-0.001**	[-0.129]	**-0.001**	[-0.147]	**-0.016****	[-2.080]
AD-OTH	**-0.001**	[-0.413]	**-0.002*****	[-3.305]	**0.001***	[1.683]	**-0.002****	[-2.514]	**0.001**	[0.365]	**0.002*****	[3.039]
Regression statistics												
Std. error	0.013		0.184		0.251		0.227		0.029			
R-squared	0.271		0.522		0.506		0.515		0.742			
LM het. test	1146.51***		1944.87***		131.792***		1496.22***		2601.82***			
Durbin-Watson	0.973		0.545		0.542		0.498		0.581			

Balanced panel
Number of observations: 5180
Number of household: 1036
AIC= -30986.1
BIC=-30761.6
Log likelihood= 31041.1

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively.

Table 5.16 Second-Step Working-Leser Model Estimates for Alberta

Variables	Co-op		Empire		Loblaw		JPG		Safeway		Others	
	Coeff.	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*
CONSTANT	**0.065**	[1.312]	**0.260*** **	[5.037]	**0.152** **	[2.150]	**0.074**	[1.260]	**0.433***	[1.916]	**0.015**	[0.065]
TOTAL EXP	**-0.005**	[-1.320]	**-0.011*** **	[-2.622]	**-0.033*** **	[-7.273]	**-0.027*** **	[-8.493]	**0.049*** **	[8.730]	**0.027*** **	[5.326]
HAGE	**0.002*** **	[5.241]	**-0.001***	[-1.670]	**-0.001**	[-1.243]	**0.001***	[1.727]	**-0.001***	[-1.825]	**-0.001**	[-1.012]
KID1	**0.010**	[0.802]	**-0.010**	[-0.763]	**0.010**	[0.677]	**0.010**	[0.973]	**0.026**	[1.518]	**-0.046*** **	[-3.070]
HHEDU1	**0.035*** **	[3.411]	**-0.023** **	[-2.118]	**0.035*** **	[2.985]	**0.022*** **	[2.694]	**-0.087*** **	[-6.131]	**0.018**	[1.631]
CHAINS	**-0.032*** **	[-10.718]	**-0.009*** **	[-2.741]	**-0.011*** **	[-3.243]	**-0.002**	[-0.777]	**-0.039*** **	[-9.487]	**0.094*** **	[25.808]
HHSIZE	**0.014*** **	[3.193]	**-0.001**	[-0.014]	**0.013*** **	[2.639]	**0.003**	[0.767]	**-0.064*** **	[-10.483]	**0.034*** **	[6.414]
IMR	**0.150*** **	[25.530]	**0.140*** **	[28.000]	**0.154*** **	[29.712]	**0.124*** **	[26.519]	**0.169*** **	[28.265]	**-0.737*** **	[-44.908]
URBAN	**-0.008**	[-1.102]	**-0.059*** **	[-7.510]	**0.003**	[0.389]	**0.023*** **	[3.944]	**0.082*** **	[7.937]	**-0.041*** **	[-4.706]
LAGGED EXP	**0.108*** **	[23.826]	**0.098*** **	[25.029]	**0.088*** **	[22.129]	**0.084*** **	[19.432]	**0.090*** **	[21.227]	**-0.468*** **	[-37.651]
AD	**0.002**	[0.439]	**0.005**	[1.364]	**0.002**	[0.496]	**-0.003**	[-0.679]	**-0.008**	[-1.505]	**0.002**	[0.160]
AD-OTH	**-0.001**	[-0.347]	**-0.001**	[-1.217]	**0.002*** **	[2.962]	**0.001**	[0.971]	**-0.001**	[-0.250]	**-0.001**	[-0.127]
Regression statistics												
Std. error	0.169		0.176		0.190		0.131		0.231			
R-squared	0.677		0.545		0.578		0.561		0.616			
LM het. test	1328.70***		1188.07***		1052.37***		1320.36***		426.385***			
Durbin-Watson	0.480		0.616		0.550		0.612		0.509			

Balanced panel
Number of observations: 2540
Number of household: 508
AIC= -5170.31
BIC= -4984.07
Log likelihood= 5220.31

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively.

In the second stage Working-Leser demand system explaining the level of expenditure at each of the six store chains in Alberta and Ontario, all the inverse mills ratios in both regions were statistically significant in the regressions, representing the fact that the instrumental variables incorporating the censoring latent variables from the first stage should be included in the second-stage Working-Leser demand system. As found in the meat choice analysis, all the lagged one year store expenditure variables (except for other store chains in both regions) had statistically significant and positive impacts on current store expenditure share in both regions indicating that past consumption is quite significant in explaining current store shopping meat purchase behaviour as well.

Total meat expenditure is shown to be a statistically significant determinant of the level of meat spending at all chains in both regions except for Safeway in Ontario and Co-op in Alberta. It was observed that Ontario households spending more on total meat were spending more at Loblaw and other store chains, while spending less at Co-op, Empire and Metro chains. In comparison, Alberta households with higher total meat expenditures tended to allocate more of the expenditures to Safeway and other store chains. In Ontario the number of chains that a household shopped at was positively related to the level of store expenditures at Empire and other stores but was negatively related to the level of store expenditures at Loblaw store chains. In Alberta, the number of chains that a household shopped at had a negative impact on the level of store expenditures at all store chains except for JPG store chains.

In Ontario better educated households spent more on meat at Metro but spent less at Empire. In Alberta, households with a higher level of education spent more on meat at Co-op, Loblaw and JPG and less at Empire and Safeway. Larger sized households spent more on meat at Loblaw and other stores in Ontario and at Co-op, Loblaw and others in Alberta. Urban dwellers spent more on meat at Metro and others and spent less on meat at Empire, Loblaw and Safeway in Ontario. Alberta urban dwellers spent more on meat at JPG and Safeway, and spent less on meat at Empire and other stores compared with those in Ontario. Older household heads spent more on meat at Co-op and JPG in Alberta, probably due to the traditional store availability in Alberta.

Households with higher incomes spent more on meat at Loblaw and other store chains, spent less on meat at Empire and Metro in Ontario. In Ontario own store advertising expenditures have positive and statistically significant effects on Loblaw and Empire. The other store advertising expenditures have negative and statistically significant effects on Empire and Metro. While in Alberta, the own and other advertising expenditures do not have statistically significant effects for each store chain.

Expenditure elasticities for both regions were presented in Table 5.17. The store expenditure elasticity measures by how much quantity demanded changes as expenditure at a particular store increased by 1 percent. The elasticities were calculated at the sample means of explanatory variables. All store expenditure elasticities were statistically significant (at 1 percent significance level, except for Co-op in Ontario due to its small marketing share), and had the expected positive signs. It was observed that some differences between the store chains in Alberta and Ontario. "Other store chains" in Alberta had the highest expenditure elasticity, while JPG in Alberta had the lowest expenditure elasticity. Expenditure elasticities for all other five store chains in Alberta and Ontario showed the similarities of being around one. The expenditure elasticities for Loblaw in Ontario and Safeway in Alberta were found to be slightly larger than one, while the others were found to be slightly lower than one.

Table 5.17 Expenditure elasticities for Ontario and Alberta

	Ontario		***Alberta***	
	Estimate	**t-statistic**	**Estimate**	**t-statistic**
Co-op	**-0.198**	*-0.3*	**0.967** ***	*41.7*
Empire	**0.938** ***	*53.8*	**0.931** ***	*36.1*
Loblaw	**1.041** ***	*104.3*	**0.827** ***	*33.0*
Metro	**0.945** ***	*72.1*	**----** ----	----
JPG	**----** ----	----	**0.657** ***	*13.6*
Safeway	**0.951** ***	*10.1*	**1.146** ***	*70.1*
Others	**1.129** ***	*22.8*	**1.413** ***	*18.2*

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively.

5.5 Comparison to Previous Studies

Table 5.18 provides a summary of previous store choice analysis. It is noticeable that household demographic variables play an important part in explanation of consumers' store choice behaviour. The same finding is that household size, income, household age, household head education can have impacts on the store choice decision making process, although these variables may have regional differences. For example, household income variable was significant in Ontario's store choice model, while it was not in the Alberta model. It can also be noticeable that the variable of households with presence of children was not significant in the estimation of the study, the same trend can be seen in many of the other studies that did not include the presence of children variable in their estimation.

Table 5.18 Explanatory variables used in previous store choice models

	Model	Data	Model Fit Test	Household Size	Family Income	Shopping Frequency	Hours Worked	Amount Spent Per Trip	Gender	Education	Age	Vehicle Owned	Household Composition	Pirce Level	Employed	Kid
Leszczyc et al., 2000	Hazard Model	panel data	BIC criterion	*+		*+	*-	*-								
Baltas and Papastathopoulou, 2003	PRINCAL model	Survey data	T-tests		*				m	m	m					
Sinha and Banerjee, 2004	Multinomial Logit	Survey data	T-tests		m				m		m	m				
Carpenter and Moore, 2006	OLS	Survey data	T-tests, Levene's test	*m	*+					*+	*+			m		
Sampson and Tiger, 1994	Retailing Life Cycle model	Survey data			+					+						
Fox et al., 2004	Tobit model	Panel data	LRT	*M	M					*m						*, m
Hu, 2006	logit models	Survey data	adjusted pseudo-R2,t-ratio	*,m	*,-					+	m					*,m
Gauri et al., 2008	multinomial logit model	Panel Data	Hausman test, LRT	m	*,+						m					
Ansari et al., 2008	Type II Tobit	Panel Data	LRT		*,m						*,m					*,m
Smith, 2004	probit model	Survey data	T-tests		*,m											

Inagami et al., 2006	Multilevel Linear Regression Models	Panel Data	AIC		m,				m	*,-	*,+	*,+	*,+		*, +	
Shergill and Chen, 2008	one-way ANOVA	Survey data	t-tests		*				*	*	m					
Bell et al., 1998	Four-segment FFC model	scanner panel data	LRT	*,m							*,m					
Bell et al., 1999	Meta-Analysis Explanatory Model	scanner panel data	T-tests		*, -					-	*,-					
Arentze et al., 2005	nested-logit model	Survey data	LRT, pseudo-R2	*									*			*

Note:
"-" and "+" denote the sign of parameters
"*" denotes the parameters are statistically significant
" " denotes the parameters are not statistically significant
"m" denotes a combination of positive and negative sign or significant and not significant variables

5.6 Summary

There are three types of choices that consumers regularly face when making purchase decisions: the type of products, the choice of particular stores and the choice of particular brands. Followed by the previous meat analysis, in this chapter the household store selection process was explored. First of all in this chapter a sample statistics description and summary of variables used in the store choice analysis are presented, and then model specification testing and the empirical estimation results and discussions is presented. The estimation of the two-stage Working-Leser demand system (Heien and Wessels, 1990) was performed respectively for Alberta and Ontario fitting panel data from 2002 to 2007. In the first stage, a Probit regression is conducted to measure the probability that a given household will purchase meat at a particular store chain. Then the inverse mills ratio representing the probability of purchase is used as an instrument in the second-stage store expenditure estimation of the Working-Leser demand system.

The results for meat analysis showed some similarities and some differences across regions as well. A habit-formation effect can also be identified in store meat expenditure behaviour for both Ontario and Alberta households. The number of store chains that a household shopped at, representing to some extent store loyalty, appears to have some impact on store choice for Ontario households, while in Alberta, it has a statistically significant impact for all stores except for JPG. The estimation results reveal that the household demographic variables play an important role in store selection criteria. The implications for meat expenditure sales at grocery store chains are summarized in Table 5.19. Store advertising expenditures have significant impacts on meat sales at Empire, Loblaw and others in Ontario. It also shows the characteristics of households shopping at each store chain, for example, younger urban dwellers with smaller household sizes are consuming more meat products at Safeway in Alberta. The meat manufacturers and grocery retailers can use this information to better market to their targeted customers to increase meat sales.

Table 5.19 Summary of the findings for the store choice models, Ontario and Alberta, 2002-2007

	Store Chains	*Price Elas.*	*Exp Elas.*	*Own Ad*	*Characteristics of HH who buy*
ON	**Co-op**	N/A	N	N	All households
	Empire	N/A	Inelastic	Significant	Rural dwellers with lower incomes and educations
	Loblaw	N/A	Elastic	Significant	Rural dwellers with higher incomes and larger household sizes
	Metro	N/A	Inelastic	N	Younger urban dwellers with lower incomes, smaller household sizes, better education
	Safeway	N/A	Inelastic	N	Younger rural dwellers with smaller household sizes
	Others	N/A	Elastic	Significant	Older urban dwellers with larger household sizes and higher incomes
AB	**Co-op**	N/A	Inelastic	N	Older households with better education and large household sizes
	Empire	N/A	Inelastic	N	Younger rural dwellers with lower education
	Loblaw	N/A	Inelastic	N	Older urban dwellers with higher education
	JPG	N/A	Inelastic	N	Households with larger household sizes and higher education
	Safeway	N/A	Elastic	N	Younger urban dwellers with smaller household sizes and lower education
	Others	N/A	Elastic	N	Rural dwellers with larger household sizes

Note: N denotes the parameters are not statistically significant at 10 percentage level or better.

Chapter 6 National and Store Brand Choice Analysis

6.1 Introduction

The third objective of the study is to identify how consumers make decisions about private label versus national brand meat products in the fully processed meat category. A major part of meat purchasing as discussed in Chapter 4 is in fresh meat forms, most of which are sold in random weights and in generic packaging which do not identify companies. Thus the fresh meat part of the market is not optimal for examining the recent importance of branding in choice decisions. In order to identify the impacts of branding, the data used in this analysis was narrowed down to focus on the fully processed meat product category which consists of national brand and store brand products. Fully processed beef products have a very small share in the market, thus are omitted from the analysis. Three other types of fully processed meat products, namely, fully processed pork, poultry and other meats (e.g. seafood) are considered in this analysis. In this analysis the impact of price, advertising, demographic and regional characteristic differences on brand choice behaviour, and how these differences vary across meat types is the focus. In this chapter, the data setup for the analysis is provided followed by the data descriptive statistics. The explanations of model specification testing and econometric methods are given. The model results and summary are provided in the final section of the chapter.

6.2 Data Setup and Descriptive Statistics

ACNielsen Homescan™ data is sourced for this brand choice analysis. The brand choice demand analysis focuses on the fully processed meat purchase information in the provinces of Ontario and Alberta over the time period 2002 to 2007. The same household panel as used in chapter 4 and 5 was analysed in this chapter in order to make comparisons among meat type choices, store choices, and brand choices, which is presented in the final chapter of the thesis. As discussed in previous chapters, the

panel totalled 1029 households in Ontario and 502 households in Alberta in the balanced panel (there is a slightly decrease on the household numbers, as 7 households in Ontario and 6 households in Alberta that did not have any purchases in the fully processed pork, poultry and others categories over 2002 to 2007 are dropped from the panel for estimation purposes).

Three fully processed meat types: pork, poultry, and other meat (mainly seafood products) were the focus in the analysis. In order to better understand brand choice decisions, fully processed meat products are grouped into two brand categories: national brands and private labels/store brands. Then six choice alternatives in this analysis were identified (Table 6.1): (1) national brand pork, poultry and others; (2) store brand pork, poultry and others. Weak separability is assumed across the six fully processed meat categories. These product purchases were aggregated into annual expenditures by each household.

Table 6.1 Brand Categories for fully processed meat

Brand Categories	**Brands for Pork, Poultry, Others (mainly seafood)**	
National Brands	Schneider	Grimms
	Maple Leaf	Burns
	Mitchells	Olympic
	High Liner	Maple Birch
	Fletchers	Cooks
	Harvest	Olymel
	Sterling Silver	Capital Packers
	Anchor	Etc...
Private Labels/Store Brands	Presidents Choice	Compliments
	No Name	Country Morning
	Safeway Select	Western Family
	Butchers Cut	Etc...

Source: ACNielsen Homescan™ Panel, 2002 to 2007.

6.2.1 Total Expenditure on Branded Meat

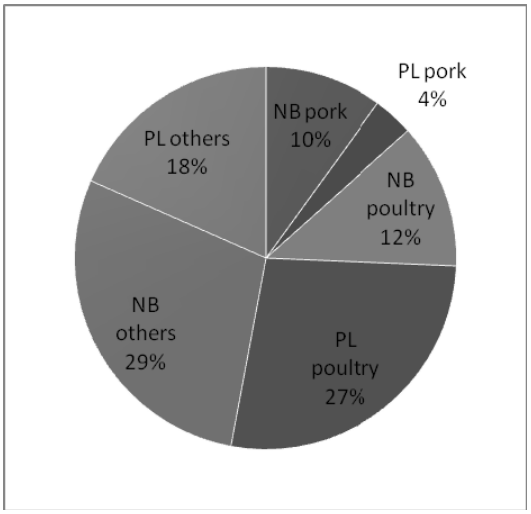
Aggregate annual expenditures of meat for the period 2002 to 2007 are reported in this section. Tables 6.2 and 6.3 below report aggregate market shares for each of the twelve meat categories in Ontario and Alberta.

Table 6.2 Market share for each brand meat category in Ontario 2002-2007

	2002	***2003***	***2004***	***2005***	***2006***	***2007***
Six brand categories						
NB pork	3%	3%	11%	12%	14%	14%
NB pork	1%	1%	4%	5%	4%	4%
NB poultry	18%	14%	11%	12%	11%	10%
PL poultry	35%	37%	31%	24%	20%	21%
NB others	26%	25%	27%	30%	31%	32%
PL others	18%	20%	16%	18%	20%	19%
Total	100%	100%	100%	100%	100%	100%
By branding						
National brands	47%	42%	49%	53%	55%	56%
Private labels	53%	58%	51%	47%	45%	44%
Total	100%	100%	100%	100%	100%	100%
By meat types						
Pork total	3%	4%	15%	17%	19%	18%
Poultry total	54%	51%	42%	35%	31%	30%
Others total	43%	45%	43%	47%	50%	52%
Total	100%	100%	100%	100%	100%	100%
Note: NB=national brands PL=private labels/store brands						

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.1 Average market share for each brand meat category in Ontario 2002-2007



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

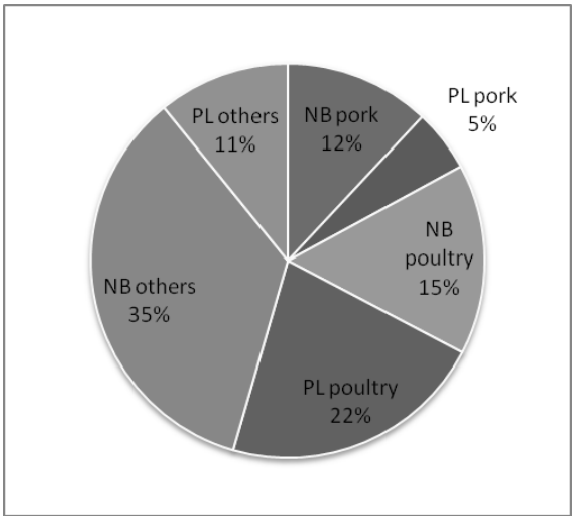
Table 6.3 Market share for each brand meat category in Alberta 2002-2007

	2002	***2003***	***2004***	***2005***	***2006***	***2007***
Six brand categories						
NB pork	11%	10%	14%	12%	13%	11%
PL pork	1%	2%	4%	6%	7%	9%
NB poultry	17%	17%	15%	13%	16%	16%
PL poultry	33%	27%	18%	21%	17%	18%
NB others	29%	33%	37%	37%	34%	36%
PL others	10%	11%	11%	10%	13%	10%
Total	100%	100%	100%	100%	100%	100%
By branding						
National brands	56%	60%	67%	62%	63%	63%
Private labels	44%	40%	33%	38%	37%	37%
Total	100%	100%	100%	100%	100%	100%
By meat types						
Pork total	12%	13%	18%	18%	20%	20%
Poultry total	50%	44%	34%	35%	33%	34%
Others total	38%	44%	48%	47%	47%	46%
Total	100%	100%	100%	100%	100%	100%

Note: NB=national brands PL=private labels/store brands

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.2 Average market share for each brand meat category in Alberta 2002-2007



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

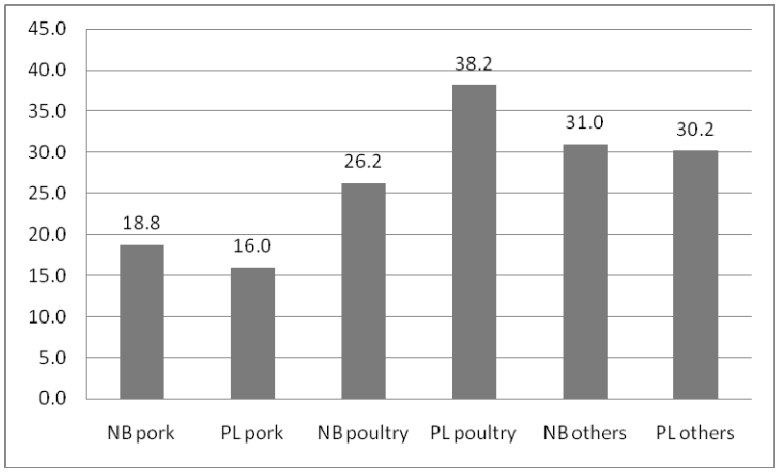
Tables 6.4 and 6.5 report the average spending per household per year for each meat category from 2002 to 2007 in Alberta and Ontario. Average annual household total expenditure ranged from $267 to $324 in Ontario and $311 to $344 in Alberta.

Table 6.4 Ontario average annual brand expenditure per household (C$) 2002-2007

	2002	***2003***	***2004***	***2005***	***2006***	***2007***
Six brand categories						
NB pork	12	13	18	21	20	19
PL pork	9	12	16	17	17	16
NB poultry	26	26	27	26	27	26
PL poultry	38	41	44	39	31	36
NB others	27	27	31	32	34	34
PL others	28	32	27	31	32	31
Total	140	150	163	166	161	162
By branding						
National brands	65	66	76	79	81	79
Private labels	75	85	87	87	80	83
By meat types						
Pork total	21	25	34	38	37	36
Poultry total	64	67	71	65	58	61
Others total	55	58	58	63	66	65

Note: NB=national brands PL=private labels/store brands;
average expenditures were calculated based on households with positive purchases
Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.3 Ontario average annual brand expenditure per household (C$) 2002-2007



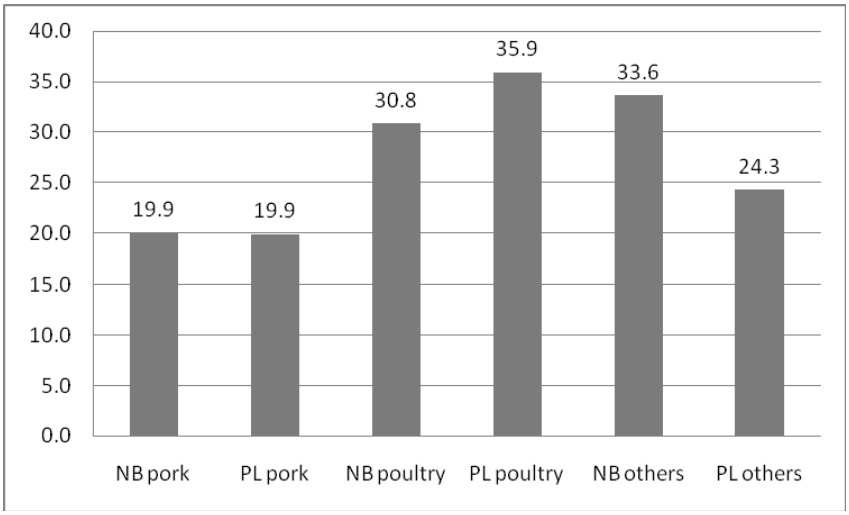
Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Table 6.5 Alberta average annual brand expenditure per household (C$) 2002-2007

	2002	***2003***	***2004***	***2005***	***2006***	***2007***
Six brand categories						
NB pork	19	18	24	19	20	18
PL pork	12	18	16	17	23	25
NB poultry	29	27	33	30	32	34
PL poultry	39	36	33	38	35	34
NB others	25	29	41	38	31	37
PL others	21	26	24	22	29	23
Total	145	154	172	164	170	171
By branding						
National brands	73	74	98	87	83	89
Private labels	72	80	74	77	86	82
By meat types						
Pork total	31	36	40	36	43	43
Poultry total	68	63	67	68	67	68
Others total	46	55	65	60	60	60

Note: NB=national brands PL=private labels/store brands;
average expenditures were calculated based on households with positive purchases
Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.4 Alberta average annual brand expenditure per household (C$) 2002-2007



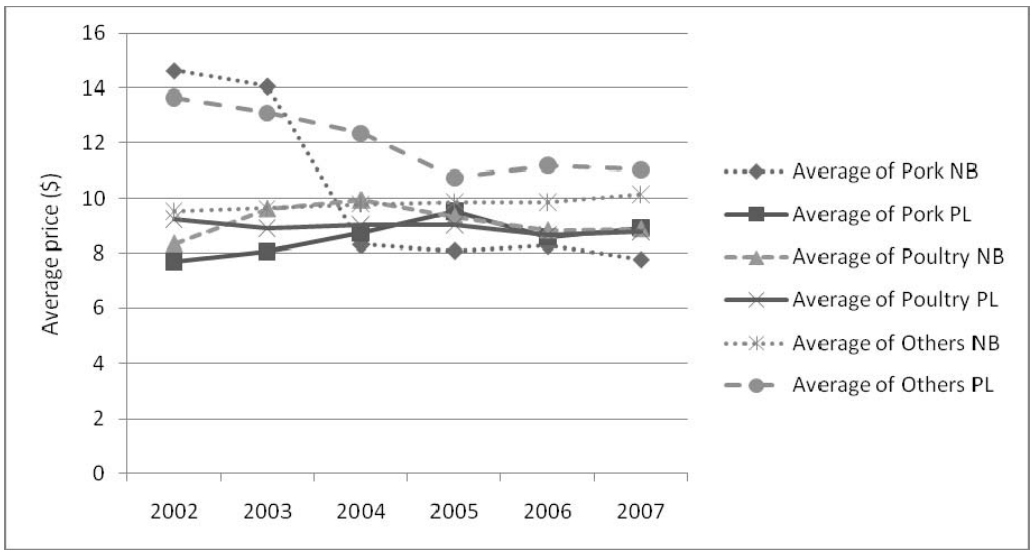
Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

For estimation purposes, meat prices and advertising expenditures (Table 6.6) by industry are also considered in the analysis. Although ACNielsen Homescan™ panel does not contain this information, most of the fully processed meat products (except for pork category, most of which are random weighted ham products) are UPC coded which offer detailed product information (e.g. product quantities, brands, manufactures, etc.). Thus prices of fully processed poultry and other meats can be obtained by their total meat expenditure divided by total meat quantities for each household. For the fully processed pork category, due to the fact that most processed pork (ham) products are not UPC coded and are random weighted, the ham prices from the ACNielsen MarketTrack™ scanner data are used as proxy prices for the fully processed pork category. The average prices for all branded meat products are shown in Figures 6.5 and 6.6.

The advertising expenditures for branded meat products, measured in millions of Canadian dollars, were also obtained from Nielsen Media Measurement™ advertising data. National advertising expenditures are summed to annual according to six meat categories and are used as proxy advertising expenditures for Alberta and Ontario (Table 6.6 and Figure 6.7). Each household faces same advertising expenditures for each meat, two kinds of advertising are thus used for each type of branded meat

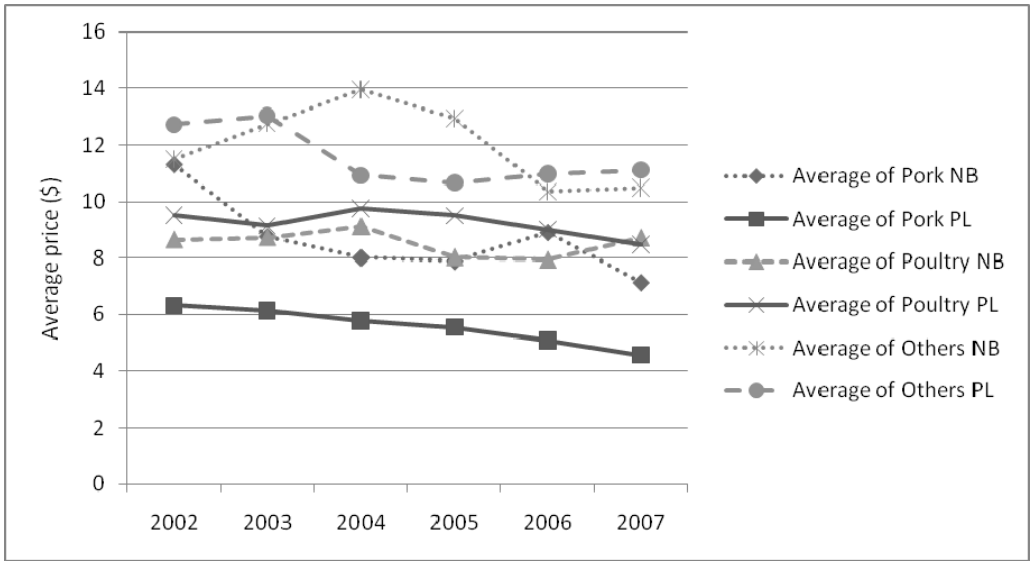
products: "own meat advertising" and "all other meat advertising" in order to deal with the issue of small advertising expenditure variation across households.

Figure 6.5 Average of branded meat prices (C$) in Ontario 2002-2007



Source: ACNielsen Homescan™ panel and Nielsen MarketTrack™ scanner data.

Figure 6.6 Average of branded meat prices (C$) in Alberta 2002-2007



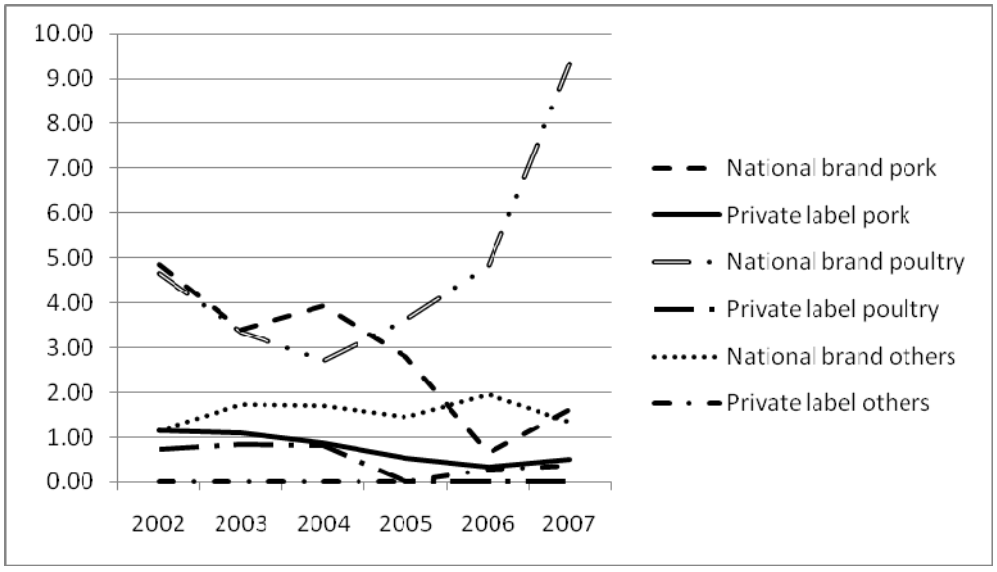
Source: ACNielsen Homescan™ panel and Nielsen MarketTrack™ scanner data.

Table 6.6 Proxy branded meat advertising expenditures (Million C$) for Ontario and Alberta models, 2002-2007

Meat types	*National brand pork*	*Private label pork*	*National brand poultry*	*Private label poultry*	*National brand others*	*Private label others*
2002	4.85	1.16	4.66	0.72	1.14	0.00
2003	3.41	1.10	3.36	0.86	1.73	0.00
2004	3.94	0.87	2.72	0.81	1.71	0.00
2005	2.79	0.55	3.63	0.01	1.46	0.00
2006	0.65	0.34	4.82	0.02	1.97	0.28
2007	1.62	0.50	9.34	0.00	1.35	0.36

Source: Nielsen Media Measurement™ national advertising data, 2002-2007.

Figure 6.7 Proxy branded meat advertising expenditures (Million C$) for Ontario and Alberta models, 2002-2007



Source: Nielsen Media Measurement™ national advertising data, 2002-2007.

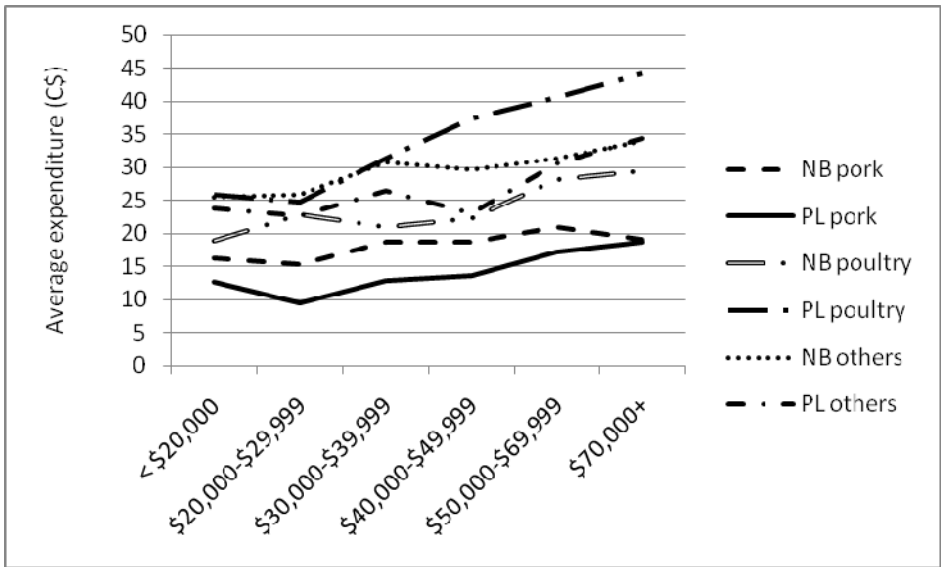
6.2.2 Household Branded Meat Expenditure Patterns, Levels

The same as in the previous analyses, household demographic variables are used to segment consumers into groups with similar needs and background. The relationship between branded meat expenditure patterns and household demographics is shown in the following figures and tables.

Household income:

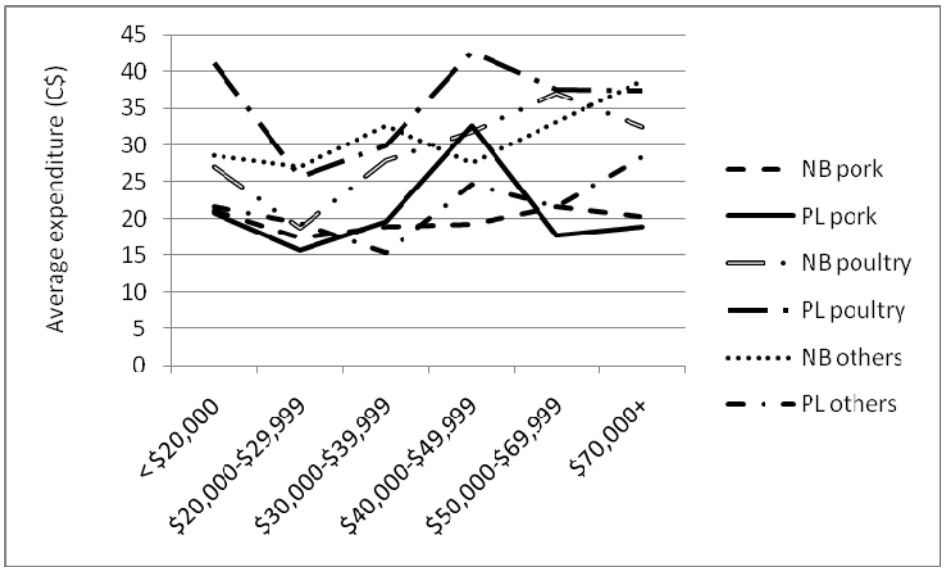
It is noticeable that as household incomes increase, higher consumption of branded meat in Alberta occurs. It also indicates that different income levels vary in impacts on the six branded meat product consumption in both regions.

Figure 6.8 Household incomes and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.9 Household incomes and average annual meat expenditures (C$) in Alberta

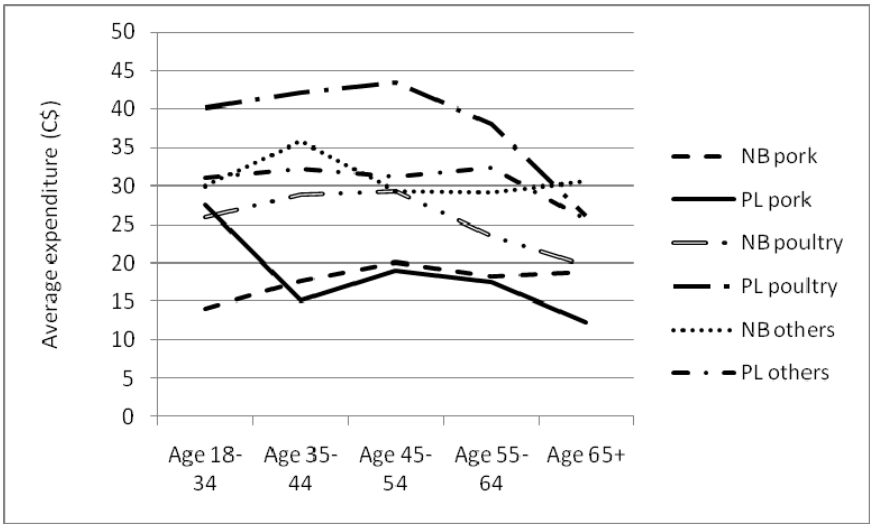


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Household age:

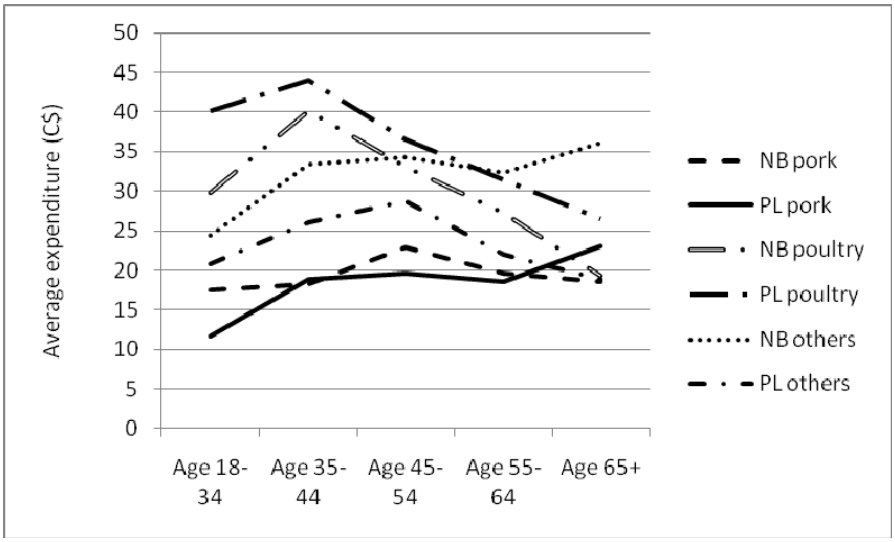
It is noticeable that as household incomes increase, lower consumption of national and store brand poultry products in Ontario and Alberta occurs.

Figure 6.10 Household age and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.11 Household age and average annual meat expenditures (C$) in Alberta

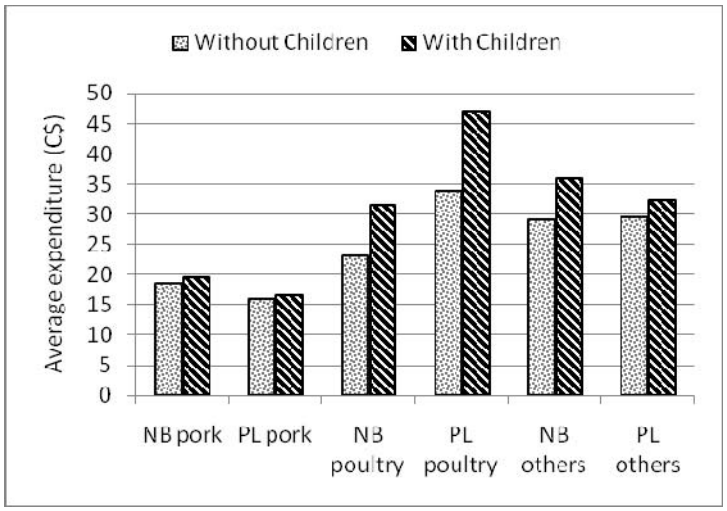


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Presence of children:

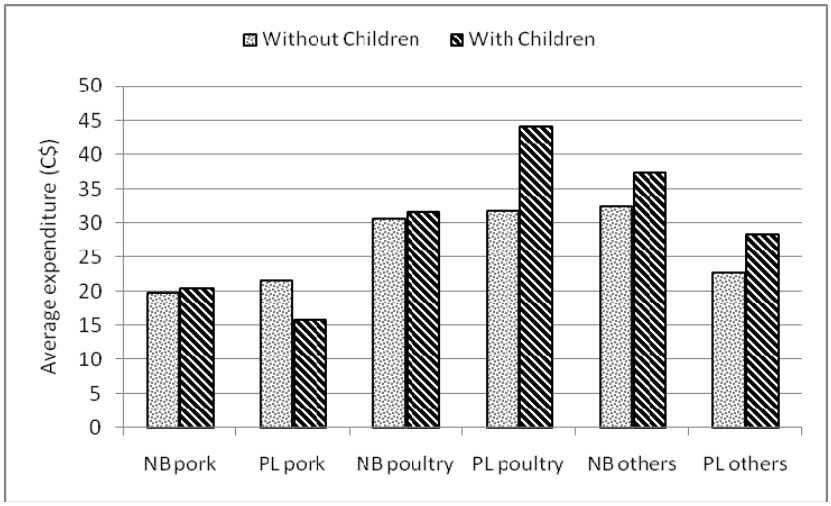
In Ontario, households with children spend more on branded poultry and national brand other meat products. In Alberta, households with children spend more on private label poultry and national brand other meat products.

Figure 6.12 Households with children and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.13 Households with children and average annual meat expenditures (C$) in Alberta

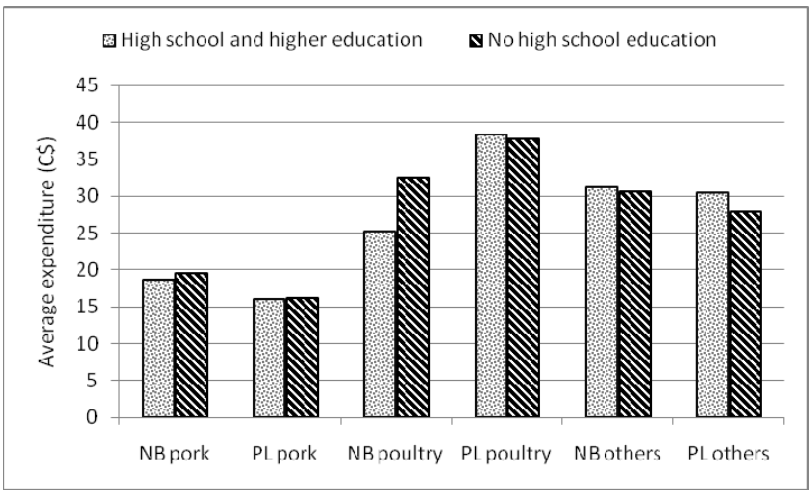


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Education:

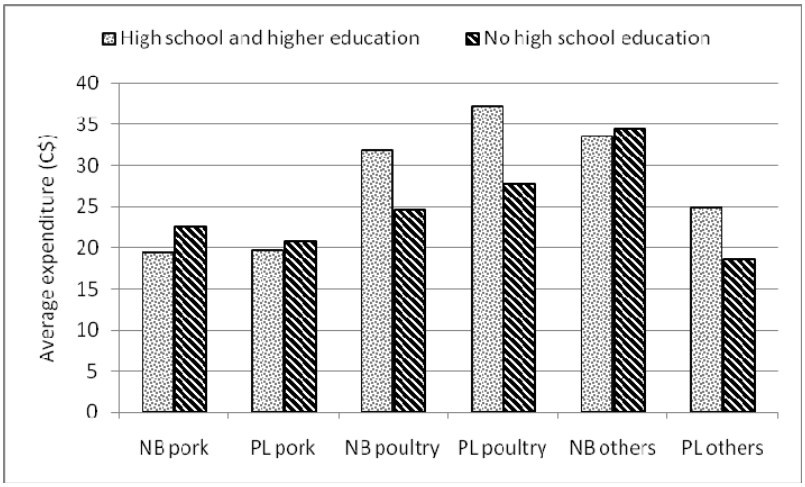
Household head education levels are observed to have little relationship with branded meat purchasing in Ontario and branded pork products in Alberta. Households with higher education spend more on branded poultry in Alberta.

Figure 6.14 Household education and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.15 Household education and average annual meat expenditures (C$) in Alberta

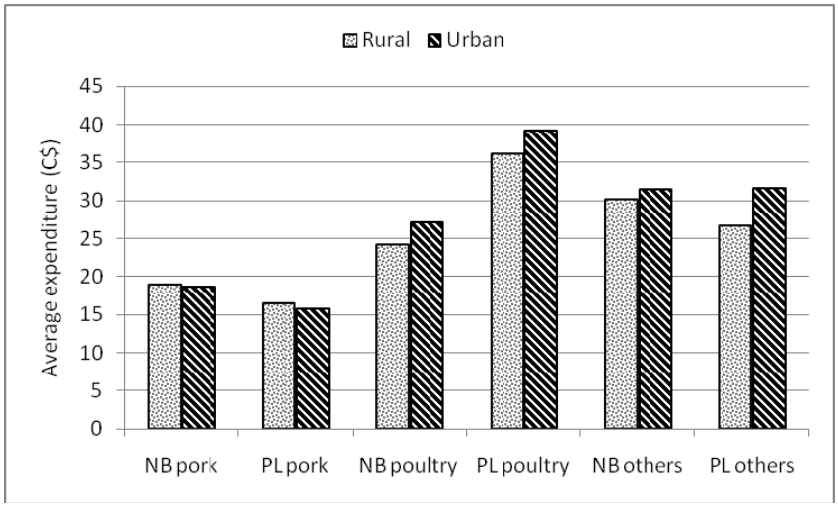


Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Urban and Rural:

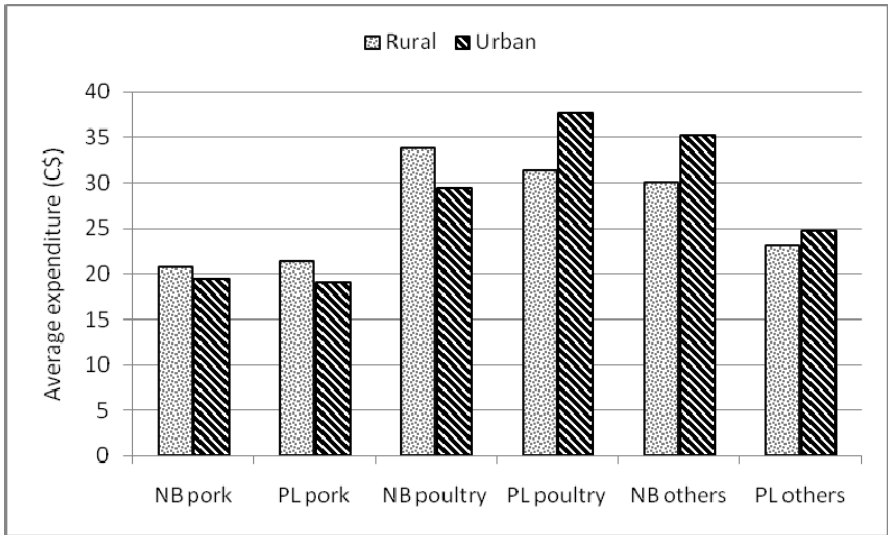
Urban dwellers in Ontario have higher branded poultry consumption and urban dwellers in Alberta are spending more on private label poultry and branded other meat products.

Figure 6.16 Households residing in urban and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

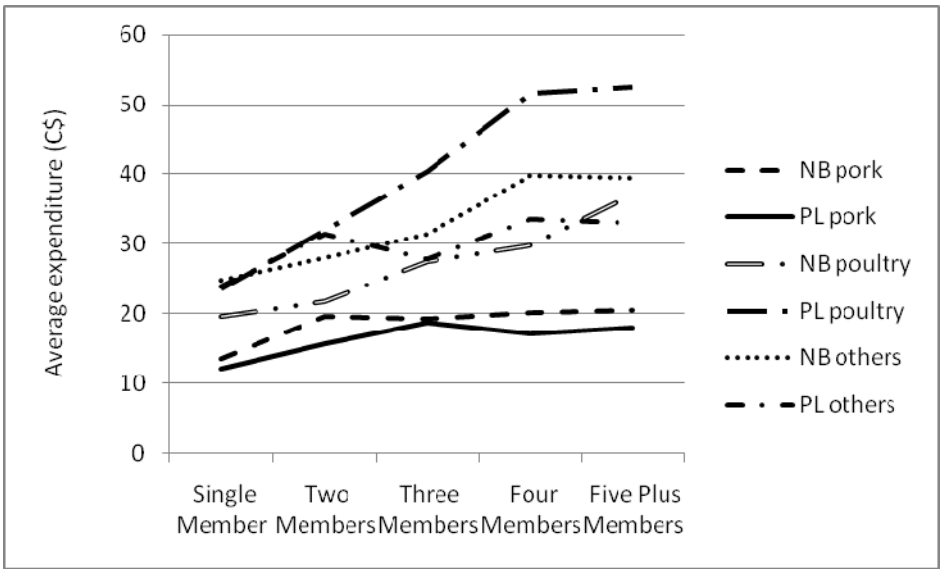
Figure 6.17 Households residing in urban and average annual meat expenditures (C$) in Alberta



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

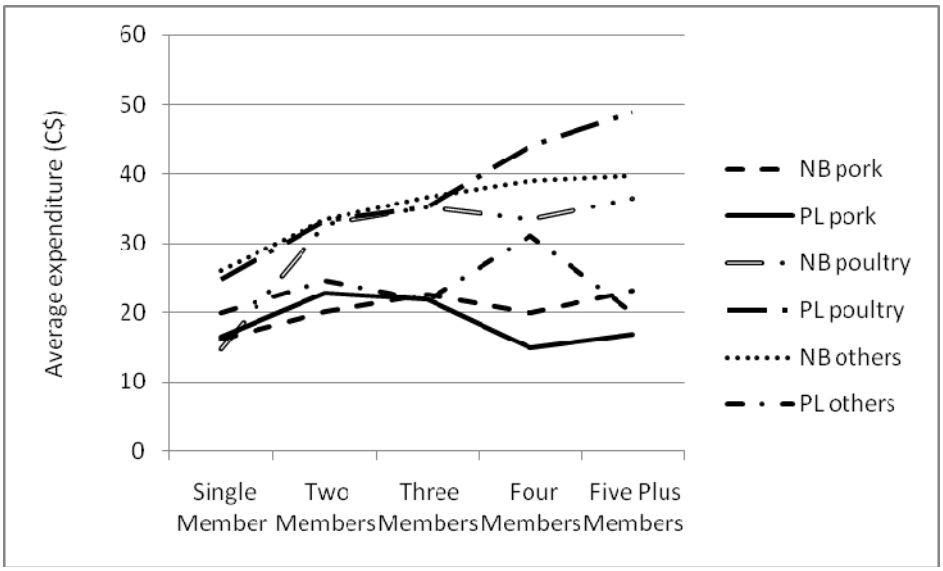
Household size:

Figure 6.18 Household size and average annual meat expenditures (C$) in Ontario



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Figure 6.19 Household size and average annual meat expenditures (C$) in Alberta



Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Tables 6.7 and 6.8 report the average branded meat expenditure (Can $) and households with different demographic information in Ontario and Alberta over the period 2002 to 2007. The common finding is that there are significant demographic differences in household purchases of branded meat products across provinces.

Table 6.7 Average branded meat expenditure (C$) and households with different demographic information in Ontario 2002-2007

Demographics	*NB pork*	*PL pork*	*NB poultry*	*PL poultry*	*NB others*	*PL others*
Household income($)						
10000	16	13	19	26	25	24
24999.5	15	9	23	25	26	23
34999.5	19	13	21	31	31	27
44999.5	19	14	22	37	30	23
59999.5	21	17	28	41	31	31
74999.5	19	19	29	44	34	34
Household age						
26	14	28	26	40	30	31
39.5	18	15	29	42	36	32
49.5	20	19	29	43	29	31
59.5	18	18	24	38	29	32
69.5	19	12	20	26	31	26
Children						
Without children	19	16	23	34	29	29
With children	20	16	31	47	36	32
Education						
High school & higher	19	16	25	38	31	31
No high school	20	16	32	38	31	28
Residing in						
Rural	19	17	24	36	30	27
Urban	19	16	27	39	31	32
Household size						
Single member	14	12	20	23	25	24
Two members	20	16	22	32	28	31
Three members	19	19	27	40	31	28
Four members	20	17	30	52	40	33
Five and over five	20	18	37	53	39	33

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

Table 6.8 Average branded meat expenditure (C$) and households with different demographic information in Alberta 2002-2007

Demographics	*NB pork*	*PL pork*	*NB poultry*	*PL poultry*	*NB others*	*PL others*
Household income($)						
10000	21	21	27	41	29	22
24999.5	17	16	19	26	27	19
34999.5	19	20	28	30	33	15
44999.5	19	33	32	43	28	25
59999.5	22	18	37	37	33	22
74999.5	20	19	32	37	39	28
Household age						
26	18	12	30	40	24	21
39.5	18	19	40	44	33	26
49.5	23	20	33	36	34	29
59.5	20	19	27	31	32	22
69.5	19	23	19	26	36	19
Children						
Without children	20	21	31	32	32	23
With children	20	16	32	44	37	28
Education						
High school & higher	19	20	32	37	34	25
No high school	23	21	25	28	34	19
Residing in						
Rural	21	21	34	31	30	23
Urban	19	19	29	38	35	25
Household size						
Single member	16	16	15	25	26	20
Two members	20	23	33	33	33	25
Three members	23	22	35	35	37	22
Four members	20	15	33	44	39	31
Five and over five	23	17	36	49	40	20

Source: Tabulations from ACNielsen Homescan™ Panel, 2002-2007.

6.3 Model Structure and Model Specification

The source of data used in the national brands and store brands analysis is the same balanced panel of sample data that is used in previous analyses in sections 4.3 and 5.3. Due to the zero expenditure problems, not all households in Ontario and Alberta have positive expenditures on all six meat categories (national brands or private labels) in each year. It is assumed each household faces a two-step hierarchy in decision making: households first make the decision of what brands and what types of meat to purchase (participation step), then they will decide how much they will spend on the given product once they have made the brand choice decision (expenditure step). Table 6.9 shows the definitions of variables used in the model and their mean values.

Table 6.9 Definition and sample statistics of variables used for brand choice analysis

		Ontario		Alberta	
First stage binary dependent variables		**Mean**	**SD**	**Mean**	**SD**
D1NB	1 if choose NB pork, 0 otherwise	0.34	0.47	0.37	0.48
D1PL	1 if choose PL pork, 0 otherwise	0.14	0.34	0.16	0.36
D3NB	1 if choose NB poultry, 0 otherwise	0.30	0.46	0.31	0.46
D3PL	1 if choose PL poultry, 0 otherwise	0.46	0.50	0.37	0.48
D4NB	1 if choose NB others, 0 otherwise	0.59	0.49	0.63	0.48
D4PL	1 if choose PL others, 0 otherwise	0.39	0.49	0.27	0.45
Second stage expenditure share dependent variables					
S1NB	expenditure share of NB pork	0.12	0.25	0.14	0.26
S1PL	expenditure share of NB pork	0.03	0.12	0.05	0.16
S3NB	expenditure share of NB poultry	0.10	0.21	0.12	0.24
S3PL	expenditure share of PL poultry	0.20	0.28	0.16	0.27
S4NB	expenditure share of NB others	0.29	0.34	0.33	0.36
S4PL	expenditure share of PL others	0.14	0.25	0.09	0.21
Logged forms of meat prices					
LP1NB	logged price of NB pork	0.99	0.13	0.93	0.10
LP1PL	logged price of NB pork	0.91	0.05	0.93	0.06
LP3NB	logged price of NB poultry	0.95	0.09	0.92	0.11
LP3PL	logged price of PL poultry	0.94	0.11	0.95	0.10
LP4NB	logged price of NB others	0.97	0.12	1.05	0.16
LP4PL	logged price of PL others	1.06	0.11	1.05	0.09

Table 6.9 continued...

Variables	Definitions	Ontario		Alberta	
		Mean	SD	Mean	SD
Advertising expenditure (Million CAN$) by meat types					
AD1NB	Own AD of NB pork	2.88	1.40	2.88	1.40
AD1PL	Own AD of NB pork	0.75	0.31	0.75	0.31
AD3NB	Own AD of NB poultry	4.75	2.18	4.75	2.18
AD3PL	Own AD of PL poultry	0.40	0.40	0.40	0.40
AD4NB	Own AD of NB others	1.56	0.28	1.56	0.28
AD4PL	Own AD of PL others	0.11	0.15	0.11	0.15
AD1NBOTH	Other AD of NB pork	7.58	1.91	7.58	1.91
AD1PLOTH	Other AD of NB pork	9.70	1.78	9.70	1.78
AD3NBOTH	Other AD of NB poultry	5.70	1.80	5.70	1.80
AD3PLOTH	Other AD of PL poultry	10.05	1.84	10.05	1.84
AD4NBOTH	Other AD of NB others	8.89	2.10	8.89	2.10
AD4PLOTH	Other AD of PL others	10.35	1.87	10.35	1.87
HH demographic and purchase information					
HHSIZE	Number of members in household	2.40	1.21	2.35	1.21
KID1	1 if HH with children , 0 otherwise	0.22	0.42	0.22	0.42
KID0	1 if HH without children , 0 otherwise	0.78	0.42	0.78	0.42
HAGE	Household head age(midpoint)	55.41	11.89	53.48	12.21
HHINC	HH income(10,000 C$, midpoint)	5.25	2.21	5.21	2.19
HHEDU1	1 if higher edu, 0 otherwise	0.86	0.35	0.87	0.34
HHEDU0	1 if no high school edu, 0 otherwise	0.14	0.35	0.13	0.34
URBAN	1 if in urban area, 0 otherwise	0.68	0.47	0.69	0.46
RURAL	1 if in rural area, 0 otherwise	0.32	0.47	0.31	0.46
TOTAL	Total expenditure on all types of meat	64.32	78.34	61.01	64.42
LTE	logged total exp on all types of meat	1.44	0.69	1.47	0.65
STORES	Number of grocery chains HH visited	1.64	1.00	1.64	1.01

Note: 1 .The source of data is ACNielsen Homescan™ Panel, 2002-07 and Nielsen Media Measurement™ national advertising data, 2002-2007
2. NB=National Brands, SB=Store brands (or Private labels).

Thus a two-step estimation following the Heien and Wessels (1990) LA/AIDS demand system procedure is applied in the brand choice demand analysis. In the first step, a Probit regression is computed to determine the probability that a given household will purchase a brand (national or store branded). The probability of participation is then used as an instrument in the second-stage estimation of the LA/AIDS demand system

(1) Participation Decision for Brand Choices (Which Brand to Choose)

The first stage of the demand system is modeled as a participation brand choice problem: the dependent variable is represented by a binary choice variable $y_{iht} = 1$ if household *h* decides to purchase a branded fully processed meat product *i* at period *t* and is $y_{iht} = 0$ if the household does not choose the given brand at period *t*. Then $E(y_{iht}) = 1 * p_{iht} + 0 * (1 - p_{iht}) = p_{iht}$, the brand choice participation decision is modeled as a function of household demographic variables, total meat purchasing and advertising expenditures in all fully processed meat products.

So the likelihood of household brand choice decision ($\Pr[y_{iht} = 1]$) can be expressed as[6]:

$$\Pr[y_{iht} = 1] = \Pr[X_{iht}^{t}\beta + a_{iht} + \varepsilon_{ih} > 0] = \phi(X_{iht}^{t}\beta)$$

and the likelihood of households that do not choose a given brand is:

$$\Pr[y_{iht} = 0] = \Pr[X_{iht}^{t}\beta + a_{iht} + \varepsilon_{ih} = 0] = 1 - \phi(X_{iht}^{t}\beta)$$

where

$$X_{iht}^{t}\beta = \beta_0 + \beta_1 * \mathrm{Texp} + \beta_2 * hhinc + \beta_3 * hage + \beta_4 * hhedu1 + \beta_5 * kid1$$
$$+ \beta_6 * hhsize + \beta_7 * T + \beta_8 * chains + \beta_9 * urban + \beta_{10} * AD + \beta_{11} * ADoth$$

[6] The definitions of each variable in the model are listed in Table 6.9.

(2) Expenditure Decision for Brand Choices (How Much to Spend)

The second step is the estimation of the branded meat expenditure share equations of the LA/AIDS demand system via seemingly unrelated regression (SUR) of the expenditure share that household h spends on a given branded meat product i in time period t.

$$w_i = \alpha_0 + \sum_j \gamma_{ij} \ln P_j + \beta_i \ln \frac{M}{P} + a_2 * \log(hage) + a_3 * \log[M_i(-1)] + a_4 * Mills + a_5 * hhedu$$
$$+ a_6 * \log(\text{hhinc}) + a_7 * KID + a_8 * urban + a_9 * \log(hhsize) + a_{10} * \log(AD) + a_{11} * \log(ADoth)$$
$$+ a_{12} * chains + a_{13} * T + \varepsilon_{it}$$

and $\ln P = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \ln p_i \ln p_j$.

6.4 Model Testing and Estimation Results

Time Series Processing (TSP) version 5.0 was used as the econometric software for the estimation of the two step linear approximate almost ideal demand system (LA/AIDS) (Heien and Wessels, 1990), which is an extension of the functional form of Working-Leser model. Estimations are performed respectively for Alberta and Ontario from 2002 to 2007. In the first step, a Probit regression is estimated to determine the probability that a given household will purchase a particular branded meat. Then the probability of purchase is used as an instrument in the second-stage estimation of LA/AIDS demand system.

6.4.1 Branded Meat Purchase Participation Decision Results for Ontario and Alberta

The probability results for the Probit model for Ontario and Alberta for each fully processed branded meat were reported in Tables 6.10 and 6.11. The statistical significance of the coefficients in the Probit models was examined using likelihood ratio tests with the null hypothesis that all slope estimates were zero. The Chi square statistics for each model were reported in the tables, indicating rejection/acceptance

of the null hypothesis. Therefore, in aggregate the coefficients of the Probit regressions for the first stage participation decision were statistically significant, many of the variables were significant at the 1 percent level. For Ontario, the generalized goodness of fit measure, scaled R-squared values, for (1) national brand pork, store brand pork; (2) national brand poultry, store brand poultry; (3) national brand other meats, store brand other meats were 0.21, 0.08, 0.24, 0.29, 0.32, 0.22, respectively. The prediction accuracies for store brand pork were higher than 80 percent. For Alberta, the scaled R-squared values for branded meats in the same order were 0.13, 0.10, 0.20, 0.21, 0.25, and 0.14, respectively. The prediction accuracies ranged from 67.5 percent for national brand pork to 84.1 percent for store brand pork.

Table 6.10 First-Step Probit Estimates of Ontario

Variables	NB Pork		PL Pork		NB Poultry		PL Poultry		NB Others		PL Others	
	Coeff.	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**
Constant	-2.793***	[0.203]	-2.639***	[0.355]	0.092	[0.284]	-0.034	[0.185]	-1.158***	[0.313]	-1.525***	[0.198]
TOTAL	0.002***	[0.001]	0.002***	[0.001]	0.002***	[0.001]	0.008***	[0.001]	0.003***	[0.001]	0.007***	[0.001]
HAGE	0.015***	[0.002]	0.012***	[0.002]	-0.019***	[0.002]	-0.016***	[0.002]	0.006***	[0.002]	0.003**	[0.002]
CHAINS	0.332***	[0.020]	0.180***	[0.024]	0.546***	[0.022]	0.338***	[0.022]	0.733***	[0.024]	0.244***	[0.021]
URBAN	-0.118***	[0.039]	-0.117**	[0.046]	0.038	[0.041]	-0.060	[0.039]	-0.019	[0.040]	0.065*	[0.038]
HHSIZE	0.046**	[0.023]	-0.001	[0.027]	0.063***	[0.023]	0.036	[0.023]	0.084***	[0.023]	-0.031	[0.022]
T	0.371***	[0.026]	0.225***	[0.066]	-0.187***	[0.031]	-0.056***	[0.020]	0.040***	[0.011]	-0.020	[0.023]
HHINC	0.021**	[0.009]	0.040***	[0.011]	-0.013	[0.010]	-0.014	[0.009]	-0.047***	[0.009]	0.061***	[0.009]
HHEDU1	-0.147***	[0.053]	0.049	[0.063]	-0.100*	[0.056]	-0.059	[0.054]	0.126**	[0.055]	0.149***	[0.054]
KID1	-0.053	[0.065]	-0.018	[0.076]	0.056	[0.064]	0.088	[0.064]	0.152**	[0.067]	0.012	[0.063]
AD	0.100***	[0.027]	0.381	[0.361]	0.044***	[0.011]	0.196**	[0.088]	-0.152	[0.112]	0.416*	[0.248]
AD-OTH	-0.102***	[0.011]	-0.097***	[0.024]	-0.061**	[0.028]	-0.003	[0.010]	-0.025*	[0.014]	-0.019*	[0.011]
Regression statistics												
Schwarz B.I.C.	3354.46		2279.33		3056.16		3360.36		3191.37		3502.01	
Log likelihood	-3302.09		-2226.96		-3003.79		-3307.99		-3139.00		-3449.64	
LR (zero slopes)	1330.85 ** [.000]		494.161 ** [.000]		1543.48 ** [.000]		1902.14 ** [.000]		2060.97 ** [.000]		1369.17 ** [.000]	
Scaled R-squared	0.21		0.08		0.24		0.29		0.32		0.22	
Predictions	71.1%		86.1%		75.6%		72.8%		74.7%		70.8%	

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively; NB=national brands, PL= private labels (store brands).

Table 6.11 First-Step Probit Estimates of Alberta

Variables	NB Pork		PL Pork		NB Poultry		PL Poultry		NB Others		PL Others	
	Coeff.	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**
Constant	-1.581***	[0.277]	-2.886***	[0.497]	-1.446***	[0.397]	-0.575**	[0.262]	-0.966**	[0.441]	-2.161***	[0.296]
TOTAL	0.001***	[0.001]	0.003***	[0.001]	0.005***	[0.001]	0.006***	[0.001]	0.005***	[0.001]	0.004***	[0.001]
HAGE	0.007***	[0.002]	0.008***	[0.003]	-0.003	[0.003]	-0.010***	[0.002]	0.001	[0.002]	0.001	[0.003]
CHAINS	0.383***	[0.028]	0.170***	[0.032]	0.350***	[0.030]	0.277***	[0.029]	0.554***	[0.034]	0.302***	[0.029]
URBAN	-0.145***	[0.053]	-0.092	[0.063]	-0.053	[0.056]	0.161***	[0.055]	0.094*	[0.056]	0.131**	[0.057]
HHSIZE	0.059*	[0.033]	0.038	[0.039]	0.125***	[0.034]	-0.025	[0.033]	-0.046	[0.034]	0.040	[0.034]
T	0.114***	[0.034]	0.339***	[0.093]	-0.023	[0.044]	-0.099***	[0.029]	0.024	[0.016]	0.036	[0.034]
HHINC	0.012	[0.012]	0.013	[0.015]	-0.021	[0.013]	-0.004	[0.013]	0.009	[0.013]	0.049***	[0.013]
HHEDU1	-0.237***	[0.074]	-0.192**	[0.086]	0.019	[0.078]	-0.162**	[0.076]	-0.160**	[0.081]	0.290***	[0.084]
KID1	-0.186**	[0.092]	0.138	[0.109]	-0.104	[0.095]	0.337***	[0.093]	0.120	[0.098]	-0.114	[0.096]
AD	0.057	[0.038]	0.889*	[0.503]	0.012	[0.016]	-0.124	[0.124]	0.111	[0.157]	-0.288	[0.367]
AD-OTH	-0.041***	[0.015]	-0.101***	[0.034]	0.001	[0.038]	0.034**	[0.014]	-0.001	[0.020]	-0.007	[0.016]
Regression statistics												
Schwarz B.I.C.	1823.90		1210.80		1607.55		1705.25		1642.57		1598.46	
Log likelihood	-1775.84		-1162.74		-1559.49		-1657.18		-1594.50		-1550.40	
LR (zero slopes)	404.416 ** [.000]		293.312 ** [.000]		604.516 ** [.000]		656.838 ** [.000]		783.256 ** [.000]		428.092 ** [.000]	
Scaled R-squared	0.13		0.10		0.20		0.21		0.25		0.14	
Predictions	67.5%		84.1%		73.8%		71.6%		73.1%		74.3%	

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively; NB=national brands, PL= private labels (store brands).

Table 6.12 Marginal effects for Probit Estimates of Ontario

Variables	NB Pork		PL Pork		NB Poultry		PL Poultry		NB Others		PL Others	
	Coeff.	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**
Constant	-0.924***	[0.077]	-0.527***	[0.074]	0.012	[0.098]	-0.081	[0.087]	-0.368***	[0.118]	-0.548***	[0.083]
TOTAL	0.001***	[0.001]	0.000***	[0.001]	0.001***	[0.001]	0.003***	[0.001]	0.001***	[0.001]	0.002***	[0.001]
HAGE	0.004***	[0.001]	0.003***	[0.001]	-0.005***	[0.001]	-0.005***	[0.001]	0.002***	[0.001]	0.001**	[0.001]
CHAINS	0.127***	[0.008]	0.038***	[0.005]	0.155***	[0.008]	0.124***	[0.009]	0.255***	[0.009]	0.101***	[0.008]
URBAN	-0.032***	[0.019]	-0.024**	[0.012]	0.010	[0.018]	-0.026	[0.021]	-0.013	[0.021]	0.031*	[0.021]
HHSIZE	0.015**	[0.009]	-0.002	[0.007]	0.019***	[0.009]	0.022	[0.012]	0.025***	[0.010]	-0.002	[0.011]
T	0.124***	[0.007]	0.043***	[0.012]	-0.060***	[0.010]	-0.020***	[0.007]	0.017***	[0.003]	-0.004	[0.008]
HHINC	0.008**	[0.004]	0.006***	[0.003]	-0.003	[0.004]	-0.003	[0.005]	-0.010***	[0.004]	0.016***	[0.004]
HHEDU1	-0.060***	[0.025]	0.013	[0.014]	-0.022*	[0.023]	-0.020	[0.028]	0.033**	[0.026]	0.056***	[0.027]
KID1	-0.040	[0.024]	-0.003	[0.017]	0.032	[0.024]	0.044	[0.034]	0.044**	[0.028]	0.001	[0.029]
AD	0.032***	[0.008]	0.083	[0.067]	0.014***	[0.003]	0.082**	[0.033]	-0.059	[0.039]	0.127*	[0.082]
AD-OTH	-0.034***	[0.003]	-0.019***	[0.004]	-0.021**	[0.009]	-0.002	[0.003]	-0.010*	[0.005]	-0.006*	[0.004]

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; NB=national brands, PL= private labels (store brands).

Table 6.13 Marginal probability for Probit Estimates of Alberta

Variables	NB Pork		PL Pork		NB Poultry		PL Poultry		NB Others		PL Others	
	Coeff.	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**
Constant	-0.566***	[0.109]	-0.623***	[0.114]	-0.480***	[0.135]	-0.239**	[0.114]	-0.307**	[0.171]	-0.669***	[0.106]
TOTAL	0.001***	[0.001]	0.001***	[0.001]	0.002***	[0.001]	0.002***	[0.001]	0.002***	[0.001]	0.001***	[0.001]
HAGE	0.002***	[0.001]	0.002***	[0.001]	-0.001	[0.001]	-0.004***	[0.001]	0.001	[0.001]	0.001	[0.001]
CHAINS	0.137***	[0.011]	0.037***	[0.008]	0.118***	[0.011]	0.110***	[0.011]	0.191***	[0.012]	0.088***	[0.010]
URBAN	-0.055***	[0.028]	-0.023	[0.018]	-0.013	[0.026]	0.067***	[0.031]	0.033*	[0.030]	0.029**	[0.025]
HHSIZE	0.019*	[0.015]	0.006	[0.009]	0.031***	[0.013]	-0.001	[0.015]	-0.018	[0.015]	0.006	[0.013]
T	0.040***	[0.011]	0.070***	[0.020]	-0.005	[0.013]	-0.035***	[0.010]	0.011	[0.005]	0.011	[0.010]
HHINC	0.002	[0.006]	0.003	[0.004]	-0.007	[0.006]	-0.002	[0.007]	0.004	[0.006]	0.019***	[0.006]
HHEDU1	-0.066***	[0.039]	-0.026**	[0.022]	0.001	[0.034]	-0.044**	[0.039]	-0.060**	[0.041]	0.085***	[0.036]
KID1	-0.067**	[0.038]	0.034	[0.025]	-0.004	[0.040]	0.085***	[0.043]	0.060	[0.040]	-0.028	[0.036]
AD	0.020	[0.013]	0.186*	[0.107]	0.004	[0.005]	-0.044	[0.039]	0.023	[0.053]	-0.092	[0.110]
AD-OTH	-0.015***	[0.005]	-0.021***	[0.007]	0.002	[0.012]	0.012**	[0.005]	-0.002	[0.006]	-0.002	[0.005]

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively; NB=national brands, PL= private labels (store brands).

Marginal effects for independent variables for each fully processed branded meat product equation are reported in Tables 6.12 and 6.13. For Ontario and Alberta, the effects of total meat expenditures and the number of chains that a household shopped at were all positive and significant, which were as same as observed in the meat analysis. The more store chains that a household shopped at, the higher the probability of purchasing both types of branded meat products. Household incomes had positive and statistically significant effects on national brand pork, store brand pork and other meats in Ontario and store brand other meats in Alberta (at 5 percent significance level). In both provinces there is evidence of an increased tendency to purchase national brand and store brand pork and lower tendency to purchase store brand poultry over time.

There are some differences between the two regions as well. For Ontario, the older the household heads, the higher the probability of consuming national/store brand pork and other meats, the lower the probability of consuming fully processed branded poultry. The effect of the variable of households with children was only positive and statistically significant (at 5 percent significance level) on national brand other meats. Urban dwellers with higher education were more likely to purchase store brand other meat. Larger household sizes had positive and statistically significant effects on all national brand meat. Own meat advertising expenditures had positive and statistically significant effects on national brand pork and poultry, and store brand poultry and other meats. Other meat advertising expenditures have negative and statistically significant effects on all branded meat (except for store brand poultry). In Alberta, older households tended to purchase national brand and store brand pork. The variable, households with presence of children had a positive and statistically significant effect on store brand poultry sales. Urban dwellers with higher education levels in Alberta were less likely to purchase store brand poultry, more likely to purchase store brand other meat. Larger households were more likely to purchase national brand pork and poultry products. Own meat advertising expenditures only had positive and statistically significant effects on store brand pork products. Other meat advertising expenditures have negative and statistically significant effects on national and store brand pork products.

6.4.2 Branded Meat Expenditure Decision Results for Ontario and Alberta

In order to select the best fitting model for the second stage LA/AIDS estimation, the same demand system testing procedure of likelihood ratio test (LRT) was conducted to select the inclusion of variables in the best fitting model using the basic models but restricting the coefficients. The objective criterion of likelihood ratio test ($\lambda_{LR} = 2\left[\ln(L)_u - \ln(L)_r\right]$) is the Chi-square statistic. If the likelihood ratio statistic of LRT ($\lambda_{LR} = 2\left[\ln(L)_u - \ln(L)_r\right]$) is significantly greater than the critical value (Chi-square statistic), then the unrestricted model is preferred by the LRT tests (Greene, 2003).

The likelihood ratios estimated from the unrestricted and restricted models for branded meat analysis were reported in Tables 6.14 and 6.15. For the Ontario branded meat choice model, the null hypotheses that total meat expenditure, inverse mills ratio (selection bias from first stage Probit model), own meat advertising, other meat advertising expenditure, one year lagged meat expenditure, urban, household head age, household education, household income, number of store chains that a household shopped at, household with children and household size have no effect on meat expenditure shares (at 10 percent significance level) are rejected. Thus, examination using LRT tests indicates that all the variables should be retained in the final LA/AIDS demand system (at 10 percent significance level). For the Alberta second stage meat choice model, the null hypotheses that total meat expenditure, inverse mills ratio (selection bias from first stage Probit model), own meat advertising, other meat advertising expenditure, one year lagged meat expenditure, urban, household head age, household education, household income, number of store chains that a household shopped at, households with children and household size have no effect on meat expenditure shares (at 10 percent significance level) are rejected. Thus, examination using LRT test indicates that all the variables should be retained in the final LA/AIDS demand system for Alberta as well.

Table 6.14 Log-likelihood ratio test results for Ontario model specification

Model	Log-likelihood	LR test statistics
Original	12079.5	
Restricting		
T	12017.8	123.4 ***
Log expenditure(-1)	11809.4	540.2 ***
Stores	11499.2	1160.6 ***
KID1	12067.8	23.3 ***
HHINC	12039.1	80.7 ***
HH Size	12072.9	13.2 **
Urban	12066.6	25.7 ***
HH head age	11915.4	328.1 ***
HHEDU1	12049.3	60.3 ***
AD	12063.7	31.6 ***
Adoth	12042.8	73.3 ***
IMR	4673.8	14811.3 ***

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively
Chi-square (5) critical values are 15.09(1%), 11.07 (5%) and 9.24 (10%).

Table 6.15 Log-likelihood ratio test results for Alberta model specification

Model	Log-likelihood	LR test statistics
Original	5270.1	
Restricting		
T	5251.5	37.1 ***
Log expenditure(-1)	5162.8	214.6 ***
Stores	5087.1	365.9 ***
KID1	5249.2	41.8 ***
HHINC	5262.9	14.3 *
HH Size	5253.2	33.8 ***
Urban	5248.4	43.4 ***
HH head age	5223.2	93.8 ***
HHEDU1	5264.3	11.6 *
AD	5264.6	11.0 **
Adoth	5260.5	19.1 ***
IMR	1135.5	8269.1 ***

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively
Chi-square (5) critical values are 15.09(1%), 11.07 (5%) and 9.24 (10%).

As same as previous analyses, adding-up restrictions required that the equation for store brand other meats was omitted for Ontario and Alberta model estimation. The parameters of the store brand other meats equation were obtained from the rest of the equations in the LA/AIDS demand system. The estimation procedure was LSQ in Time Series Processing (TSP) version 5.0 with iterative seemingly unrelated regression (SUR). The estimated parameters for the LA/AIDS demand system of both regions are presented in Tables 6.16 and 6.17. For Ontario, the goodness of fit measure, R-squared values, ranged from 0.51 for store brand pork to 0.59 for national brand poultry. For Alberta, the goodness of fit measure, R-squared values, ranged from 0.56 for national brand pork to 0.64 for store brand poultry. Other goodness of fit, Durbin-Watson statistics, AIC, BIC and log likelihood values were also presented in Table 6.16 and Table 6.17.

Table 6.16 Second-Step AIDS Model Estimates for Ontario

Variables	NB Pork		PL Pork		NB Poultry		PL Poultry		NB Others		PL Others	
	Coeff.	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*
Constant	**-0.199*** **	[-3.468]	**0.181*** **	[3.015]	**0.423*** **	[8.460]	**0.784*** **	[7.839]	**-0.098**	[-1.109]	**-0.091**	[-0.559]
T	**0.034*** **	[8.447]	**0.028*** **	[3.502]	**-0.009***	[-1.853]	**-0.025*** **	[-6.505]	**-0.001**	[-0.357]	**-0.028*** **	[-2.946]
lagged exp	**0.033*** **	[6.405]	**0.033*** **	[8.880]	**0.027*** **	[8.147]	**0.056*** **	[13.415]	**0.071*** **	[13.645]	**-0.220*** **	[-13.915]
IMR	**0.230*** **	[64.692]	**0.137*** **	[66.405]	**0.202*** **	[73.276]	**0.240*** **	[65.899]	**0.302*** **	[64.125]	**-1.110*** **	[-62.384]
CHAINS	**0.033*** **	[10.584]	**0.004*** **	[2.695]	**0.041*** **	[17.829]	**0.009*** **	[2.843]	**0.110*** **	[27.017]	**-0.198*** **	[-23.016]
KID1	**-0.026*** **	[-3.126]	**-0.006**	[-1.450]	**0.016*** **	[2.569]	**0.008**	[0.907]	**0.021****	[1.974]	**-0.012**	[-0.549]
HHINC	**0.002**	[0.442]	**0.009*** **	[3.768]	**0.005**	[1.373]	**-0.003**	[-0.549]	**-0.050*** **	[-8.190]	**0.036*** **	[2.987]
HHSIZE	**0.021*** **	[3.018]	**-0.003**	[-0.816]	**0.008**	[1.565]	**-0.004**	[-0.578]	**0.005**	[0.549]	**-0.027**	[-1.453]
URBAN	**-0.019*** **	[-3.466]	**-0.007****	[-2.508]	**0.009****	[2.269]	**-0.007**	[-1.328]	**0.007**	[1.022]	**0.017**	[1.134]
HH head age	**0.100*** **	[7.946]	**0.016****	[2.432]	**-0.096*** **	[-10.389]	**-0.128*** **	[-10.107]	**0.121*** **	[7.569]	**-0.013**	[-0.423]
HHEDU1	**-0.036*** **	[-4.806]	**-0.004**	[-1.038]	**-0.028*** **	[-5.146]	**-0.008**	[-1.095]	**0.033*** **	[3.438]	**0.043****	[2.091]
Own AD	**0.018**	[1.361]	**0.165*** **	[2.923]	**0.052****	[2.286]	**0.022*** **	[2.813]	**-0.236*** **	[-2.947]	**-0.020**	[-0.217]
Other AD	**-0.206*** **	[-5.887]	**-0.320*** **	[-4.216]	**-0.002**	[-0.053]	**-0.040**	[-0.423]	**-0.159*** **	[-3.495]	**0.726*** **	[6.102]
logged TOTAL exp	**-0.104*** **	[-14.970]	**-0.002**	[-0.675]	**-0.033*** **	[-6.556]	**0.063*** **	[8.341]	**-0.157*** **	[-17.489]	**0.234*** **	[11.822]
Regression statistics												
Std. error	0.175		0.090		0.128		0.176		0.224			
R-squared	0.540		0.512		0.593		0.587		0.565			
LM het. test	1943.26 ** [.000]		1168.42 ** [.000]		1571.34 ** [.000]		1357.57 ** [.000]		1144.46 ** [.000]			
Durbin-Watson	1.315		1.400		1.215		1.190		1.197			

Balanced panel
Number of observations: 5145
Number of household: 1029
AIC= -11994.5
BIC=-11647.9
Log likelihood= 12079.5

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively; NB=national brands, PL= private labels (store brands).

Table 6.17 Second-Step AIDS Model Estimates for Alberta

Variables	NB Pork		PL Pork		NB Poultry		PL Poultry		NB Others		PL Others	
	Coeff.	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*	*Coeff.*	*t-statistic*
Constant	**-0.067**	[-0.890]	**-0.155**	[-1.569]	**0.264*** **	[3.330]	**0.144**	[1.193]	**-0.237***	[-1.922]	**1.050*** **	[4.629]
T	**0.009***	[1.908]	**0.002**	[0.128]	**-0.007**	[-1.042]	**-0.024*** **	[-5.358]	**0.008** **	[2.149]	**0.013**	[0.941]
lagged exp	**0.023*** **	[3.640]	**0.010***	[1.776]	**0.053*** **	[9.970]	**0.036*** **	[7.141]	**0.051*** **	[7.195]	**-0.173*** **	[-9.266]
IMR	**0.243*** **	[50.425]	**0.189*** **	[53.010]	**0.230*** **	[51.857]	**0.244*** **	[55.264]	**0.340*** **	[50.018]	**-1.245*** **	[-49.531]
CHAINS	**0.039*** **	[9.206]	**0.003**	[1.286]	**0.023*** **	[6.321]	**0.011*** **	[3.035]	**0.079*** **	[14.403]	**-0.156*** **	[-13.398]
KID1	**-0.037*** **	[-3.079]	**-0.009**	[-1.179]	**-0.032*** **	[-3.006]	**0.038*** **	[3.496]	**0.057*** **	[3.535]	**-0.016**	[-0.481]
HHINC	**-0.004**	[-0.560]	**-0.005**	[-1.159]	**-0.015*** **	[-2.586]	**-0.013** **	[-2.215]	**0.010**	[1.103]	**0.027***	[1.709]
HHSIZE	**0.026** **	[2.531]	**0.018*** **	[2.670]	**0.033*** **	[3.673]	**-0.009**	[-1.004]	**-0.039*** **	[-2.912]	**-0.028**	[-1.158]
URBAN	**-0.030*** **	[-3.979]	**-0.006**	[-1.166]	**-0.017** **	[-2.549]	**0.026*** **	[3.808]	**0.029*** **	[2.841]	**-0.001**	[-0.056]
HH head age	**0.068*** **	[4.224]	**0.032*** **	[3.069]	**-0.049*** **	[-3.443]	**-0.097*** **	[-6.717]	**0.071*** **	[3.311]	**-0.026**	[-0.612]
HHEDU1	**-0.018***	[-1.679]	**-0.009**	[-1.320]	**0.021** **	[2.176]	**-0.009**	[-0.903]	**-0.015**	[-1.077]	**0.031**	[0.964]
Own AD	**-0.001**	[-0.045]	**-0.075**	[-0.821]	**0.029**	[0.834]	**-0.026*** **	[-2.704]	**0.190**	[1.620]	**-0.117**	[-0.806]
Other AD	**-0.093** **	[-2.043]	**0.074**	[0.611]	**-0.025**	[-0.485]	**0.404*** **	[3.461]	**0.113***	[1.697]	**-0.473*** **	[-2.736]
logged TOTAL exp	**-0.091*** **	[-9.264]	**-0.009**	[-1.452]	**0.019** **	[2.194]	**0.063*** **	[7.092]	**-0.125*** **	[-9.561]	**0.142*** **	[5.345]
Regression statistics												
Std. error	0.172		0.112		0.152		0.153		0.229			
R-squared	0.558		0.559		0.595		0.641		0.594			
LM het. test	903.048 ** [.000]		874.042 ** [.000]		887.132 ** [.000]		749.065 ** [.000]		335.277 ** [.000]			
Durbin-Watson	1.304		1.424		1.223		1.269		1.277			
Balanced panel												
Number of observations: 2510												
Number of household: 502												
AIC= -5185.08												
BIC=-4868.99												
Log likelihood= 5270.08												

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively; NB=national brands, PL= private labels (store brands).

In the second stage LA/AIDS demand system explaining the impacts of demographic and other characteristics on the level of expenditures for each of the six meat categories, all the inverse mills ratios in both regions were found to be statistically significant in the regressions, indicating that the instrumental variables incorporating the censoring latent variables form the first stage should be accounted for a potential sample selection bias in the second-stage estimation of the demand relations. Total meat expenditure variables had significant impacts on both regions (except for store brand pork in Ontario and Alberta, at 10 percent significance level). All the one year lagged meat expenditure variables (except for store brand pork in Alberta) had statistically significant and positive impacts on meat expenditure shares in both regions (at 10 percent significance level). This indicates that past consumption behaviour is quite significant in explaining current branded meat purchase behaviour.

It was observed that in both regions younger household heads were less likely to spend more on national and store brand poultry, more likely to spend more on national brand pork and other meat, and store brand pork. In Ontario and Alberta, larger households were more likely to purchase national brand pork. For the variable, the number of store chains that a household shopped at, a strong positive relationship between number of stores and level of spending on national brand pork, poultry and other meats in Ontario and Alberta, indicates that households in Ontario and Alberta had much the same 'loyalty' to national brands regardless of store choices. In Ontario higher income levels were associated with lower expenditure shares for national brand other meats. In Alberta higher incomes are only associated with lower spending on national and store brand poultry. Over time there was a positive increase in sales of national and store brand pork but declining sales of store brand poultry and other meat products in Ontario. In Alberta, there was only a positive increase in sales of national brand other meats but declining sales of store brand poultry. In Ontario own meat advertising expenditure had positive and statistically significant effects on store brand pork and poultry and national brand poultry products. The price and expenditure elasticities for all the six brand meat categories were presented in Table 6.18 and Table 6.19. The elasticities were calculated at the sample means of explanatory variables.

Table 6.18 Second-Step AIDS Model Price and Expenditure Elasticities for Ontario

	Price elasticities						Expenditure
	NB Pork	**PL Pork**	**NB Poultry**	**PL Poultry**	**NB Others**	**PL Others**	**elasticities**
NB Pork	**-1.733*** **	**1.880*** **	**0.346**	**-0.088**	**0.011**	**0.034**	**0.139**
	[-5.777]	*[3.547]*	*[1.854]*	*[-1.065]*	*[0.225]*	*[0.236]*	*[0.074]*
PL Pork	**0.538*** **	**-5.450*** **	**0.276**	**0.009**	**0.072** **	**0.214** **	**0.926*** **
	[3.722]	*[-5.715]*	*[1.472]*	*[0.177]*	*[2.723]*	*[2.681]*	*[0.122]*
NB Poultry	**0.352***	**0.843**	**-1.322*** **	**-0.037**	**-0.088**	**-0.033**	**0.679*** **
	[2.194]	*[1.433]*	*[-3.427]*	*[-0.453]*	*[-1.875]*	*[-0.319]*	*[0.057]*
PL Poultry	**0.090**	**0.131**	**0.056**	**-0.615*** **	**-0.044**	**-0.587*** **	**1.321*** **
	[0.671]	*[0.427]*	*[0.364]*	*[-3.440]*	*[-0.772]*	*[-3.562]*	*[0.051]*
NB Others	**0.118**	**0.494***	**-0.308***	**-0.315*** **	**-0.558*** **	**-0.454***	**0.454*** **
	[0.967]	*[2.124]*	*[-2.371]*	*[-3.681]*	*[-4.188]*	*[-2.350]*	*[0.041]*
PL Others	**0.397***	**1.168*** **	**0.235**	**-0.237***	**0.088**	**-1.633*** **	**2.653*** **
	[2.389]	*[3.425]*	*[1.703]*	*[-2.035]*	*[0.952]*	*[-4.915]*	*[0.140]*

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively;
[values in square brackets are t-statistics]; NB=national brands, PL= private labels (store brands).

Table 6.19 Second-Step AIDS Model Price and Expenditure Elasticities for Alberta

	Price elasticities						Expenditure
	NB Pork	**PL Pork**	**NB Poultry**	**PL Poultry**	**NB Others**	**PL Others**	**elasticities**
NB Pork	**-1.089** **	**0.399**	**-0.001**	**0.014**	**-0.102**	**0.267**	**0.358*** **
	[-2.785]	*[0.797]*	*[-0.006]*	*[0.089]*	*[-1.715]*	*[0.730]*	*[0.083]*
PL Pork	**0.162**	**-1.268**	**0.108**	**0.031**	**-0.046**	**-0.132**	**0.813*** **
	[0.921]	*[-1.150]*	*[0.696]*	*[0.278]*	*[-1.210]*	*[-0.453]*	*[0.160]*
NB Poultry	**0.094**	**0.299**	**-1.167***	**-0.340** **	**-0.077**	**0.781***	**1.161*** **
	[0.622]	*[0.815]*	*[-2.429]*	*[-2.757]*	*[-1.540]*	*[2.325]*	*[0.107]*
PL Poultry	**0.182**	**0.196**	**-0.427***	**-0.948** **	**-0.033**	**0.192**	**1.393*** **
	[1.040]	*[0.534]*	*[-2.529]*	*[-2.965]*	*[-0.582]*	*[0.537]*	*[0.084]*
NB Others	**-0.151**	**-0.372**	**-0.396** **	**-0.325** **	**0.087**	**-2.417*** **	**0.625*** **
	[-1.068]	*[-1.427]*	*[-2.696]*	*[-2.805]*	*[0.843]*	*[-5.781]*	*[0.049]*
PL Others	**0.376**	**-0.087**	**0.739** **	**0.216**	**-0.493*** **	**-1.073**	**2.543*** **
	[1.566]	*[-0.160]*	*[2.844]*	*[1.051]*	*[-4.366]*	*[-1.250]*	*[0.289]*

Note: ***,** and * indicate significance at 1, 5 and 10 percent level, respectively;
[values in square brackets are t-statistics]; NB=national brands, PL= private labels (store brands).

Tables 6.18 and 6.19 present the own price and cross price effects for each of the six meat products in Ontario and Alberta. With the exception of national brand other meats in Alberta, all the own price effects are negative. The own price elasticities for national brand pork, store brand pork, national brand poultry and store brand other meats are relative elastic, which imply that a one percent change in price will have an impact larger than a one percent on the quantity demanded of the meat products. Cross price estimates for Ontario model weighed more heavily on the complement side than the substitution. There are eight statistically significant (10 percent) complement relationships compared to only five substitution relationships. For Alberta model, there are only two complement relationships and five substitution relationships.

Expenditure elasticities derived from the LAIDS model are all normal goods and statistically significant at the one percent level (except for the national brand pork in Ontario). The expenditure elasticity measures by how much quantity demanded changes for expenditure on a particular commodity group increased by one percent. Expenditure elasticities for both regions were represented in Tables 6.18 and 6.19. The elasticities are calculated at the sample means of explanatory variables. For store brand pork, national brand poultry, and national brand other meats in Ontario and national/store brand pork, and national brand other meats in Alberta, a one percent change in consumers' disposable income will yield less than a one percent change in the branded meat products purchased.

6.5 Comparison to Previous Studies

Not many previous studies, in Canada or elsewhere, can be found to focus on a demand system taking into account all the meat products at different processed levels that this section of the study has considered. Some of the research either focused on aggregate meat categories (e.g. beef, poultry, pork, etc.) or specified certain meat categories with different attributes (e.g. bone-in or boneless, skin-on or skinless poultry meats, etc.). Table 6.20 shows comparisons of the own price elasticities of this study to previous studies.

Table 6.20 A comparison of own price elasticities for pork, beef, and poultry to Canadian meat demand studies using AIDS models

Authors	Functional forms	Meat products		
		Pork	Beef	Poultry
Alston and Chalfant (1991)	AIDS	-0.84	-1.04	-0.62
Chen and Veeman (1991)	AIDS	-0.82	-0.77	-0.95
Reynolds and Goddard (1991)	LA/AIDS	-0.68	-0.74	-0.33
Eales (1996)	AIDS	-0.84	-0.78	-0.35
Xu and Veeman (1996)	AIDS	-0.69	-0.8	-0.41
Goddard et al. (2004)	AIDS	-0.26	-0.54	-0.63
Lambert et al., 2006	QUAIDS	-0.99	-0.87	-1.00
Anders and Moeser, 2008	AIDS	-1.65	-1.70	-0.34
Average		-0.85	-0.89	-0.57
Largest		-0.26	-0.54	-0.33
Smallest		-1.65	-1.70	-1.00
National brand, in Ontario	In this study LA/AIDS	-1.73***	n/a	-1.32***
National brand, in Alberta		-1.09**	n/a	-1.17*
Store brand, in Ontario		-5.45***	n/a	-0.62***
Store brand, in Alberta		-1.27	n/a	-0.95**

Note: ***, ** and * indicate significance at 1, 5 and 10 percent level, respectively.

Some studies show no direct relationship between household demographic variables and consumers' preferences for private brands (Myers, 1967; Szymanski and Busch, 1987). Other studies, however, find the household demographic variables play an important role in consumers' brand choice behaviour. The following Table 6.21 is the overview of recent store and national brand choice (modelling) literature. The results of these studies show that variables like price, household income and education level and other demographic variables play an important role in the household decision making procession. Socio-demographic variables, such as regional differences, have also great effects in the probability of purchasing national brands.

Table 6.21 Explanatory variables used in previous store/national brand choice models

variables	Martinez and Montaner, 2008	Ailawadi et al., 2008	Labeaga et al., 2007	Baltas and Argouslidis, 2007	Juhl et al., 2006	Brester and Schroeder, 1995	Guris et al., 2007	Klapper et al., 2005	Hansen and Singh, 2008	Guadagni and Little, 2008	Garretson et al., 2002	Dolekoglu et al., 2008
model	logistic regression	2SLS	logit model	multivariate regression model		Rotterdam model	Multinomial Logit Model	mixed logit	multinomial probit choice model	multinomial logit model	Structural model	Cluster model
data	Survey data	panel data	scanner panel data	regression model	Survey data	Survey data	Survey data	scanner panel data	Survey data	panel data	Survey data	Survey data
model fit test	Wald, Hosmer and Lemeshow statistical	T-tests, Adjusted R2	Pseudo-R2, AIC, HQ, BIC and CAIC	Adjusted R 2		GARP, Wu-Hausman tests	LRT	t-statistic	Adjusted R2	Chi-squared tests	Adjusted R2	t-statistic
Household Size			(+,*)	(M,)			{-,*}		(+,*)			
Family Income	(-,)	(-,)		(+,*)		{+,)	{+,*}	{+,*}	(+,*)			(m,*)
Shopping Frequency												
Hours Worked												
Amount Spent Per Trip				(M,)								
gender				(M,)			{+,*}					(m,*)
education	(-, *)	(+,)		(+,*)								
age	(-,)			(M,)				{+, }				(m,*)
Vehicle owned												
household composition												

variables	Martinez and Montaner, 2008	Ailawadi et al., 2008	Labeaga et al., 2007	Baltas and Argouslidis, 2007	Juhl et al., 2006	Brester and Schroeder, 1995	Guris et al., 2007	Klapper et al., 2005	Hansen and Singh, 2008	Guadagni and Little, 2008	Garretson et al., 2002	Dolekoglu et al., 2008
pirce		(+,)	(-,)							{-,*}		
employed								{-, }				
kid	(-,)	(+,*)						{-, }	(+,*)			
Brand loyalty	(+,)	(-,*)		(-, *)					(+,*)	{+,*}	(-,*)[+,m]	(m,*)
Store loyalty	(+,*)			(-, *)	(+,)							
Quality consciousness	(-, *)	(-, *)		(+,*)			{+, }	{+, }			(-,*)[+,*]	
Price consciousness	(+,*)	(+,)		(+,*)				{+, }			(-,*)[+,*]	
Variety seeking	(+,*)											
Storage constraints	(+,*)											
Financial constraints	(+,)											
ADVERTISING						{+,*}						(m,*)

Note:

"-" and "+" denote the sign of parameters

"*" denotes the parameters are statistically significant

" " denotes the parameters are not statistically significant

"m" denotes a combination of positive and negative sign or significant and not significant variables

[ ] denotes national brand choice

( ) denotes store brand choice

{ } denotes brand choice

6.6 Summary

Analyses on meat type choices and store choice have been conducted in the previous two chapters. In this chapter the household branded meat purchase decision making process was explained. This chapter first reported statistical descriptions and summaries of dependent variables used in the branded meat choice model, but also the empirical estimation results and discussions. The estimation of the two-stage LA/AIDS demand system, as described in Heien and Wessels (1990), was performed respectively for Alberta and Ontario from 2002 to 2007. More price availability and variances make it possible to use LA/AIDS rather than using previous Working-Leser demand system. In the first step, a Probit regression is conducted to measure the probability that a given household will purchase a particular meat type. Then the inverse mills ratio representing the probability of purchase is used as an instrument in the second-stage demand system estimation.

Results from both stages of the national versus store brand models revealed that the decision to purchase any of the six branded products was significantly affected by demographic characteristics in both Ontario and Alberta (Table 6.22). The results showed some similarities and some differences across regions as well. A habit-formation effect can also be identified in the branded meat purchasing for both Ontario and Alberta households. For the price elasticities results, it was shown that many of own price and cross price elasticities did have the expected statistically significant signs.

The implications for meat sales are summarized in Table 6.22. Branded meat advertising expenditures have significant impacts on meat sales at store brand pork, store/national brand poultry and national brand other meat products in Ontario, and store brand poultry products in Alberta. It also shows the characteristics of households buying each type of branded meat in both regions, for example, if the meat manufacturers were to develop a store brand fully processed other meat product to be sold in both Ontario and Alberta market; households with higher incomes are most likely to purchase it.

Table 6.22 Summary of the findings for the brand choice models, Ontario and Alberta, 2002-2007

	Meat types	*Price Elas.*	*Exp Elas.*	*Own Ad*	*Characteristics of HH who buy*
ON	**NB pork**	Elastic	N	N	Older rural dwellers with lower education and larger household sizes, without children
	PL pork	Elastic	Unit elastic	Significant	Older rural dwellers with higher incomes
	NB poultry	Elastic	Inelastic	Significant	Younger urban dwellers with lower incomes, with children
	PL poultry	Inelastic	Elastic	Significant	Younger households
	NB others	Inelastic	Inelastic	Significant	Older households with larger household sizes
	PL others	Elastic	Elastic	N	Households with higher incomes and education
AB	**NB pork**	Unit elastic	Inelastic	N	Older rural dwellers with lower education and larger household sizes, without children
	PL pork	N	Inelastic	N	Older household heads with larger household sizes
	NB poultry	Elastic	Elastic	N	Younger rural dwellers with higher education, larger household sizes, lower incomes without children
	PL poultry	Unit elastic	Elastic	Significant	Younger urban dwellers with lower incomes and children
	NB others	N	Inelastic	N	Older urban dwellers with smaller household sizes, and with children
	PL others	Unit elastic	Elastic	N	Households with higher incomes

Note: N denotes the parameters are not statistically significant at 10 percentage level or better.

Chapter 7 Summary and Conclusions

7.1 Introduction

In this chapter a comparison of the estimated results from the three meat purchase analyses is provided to identify similarities and differences. The implications of the study are presented, and the limitations of this study are outlined, so that the empirical results and findings could be taken into account for value added meat marketing strategies, new product development and policy planning. Potential possible future research areas are suggested.

As discussed in the previous chapters, the overall objective of the study is to investigate the impacts of socioeconomics and household demographics on Canadian households' value added meat purchase behaviour by meat type choices, by store choices, as well as by brand choices in order to improve the understanding of recent food-at-home consumption patterns and discern new trends in value added meat demand in Canada.

Three specific research objectives of the study are outlined as:

1. **Meat Purchase Behaviour and Level of Meat Processing:**
   Household level meat purchase data over the period 2002-2007 and Nielsen Media Measurement™ advertising data (2002-2007) were estimated in order to:
   a. Understand how consumers make purchase decisions around fresh, semi-processed and fully processed products for four meat type categories: beef, pork, poultry and others (mostly seafood products).
   b. Quantify the impacts of demographic and regional characteristic differences on meat purchase behaviour, and variability in behaviour across meat types.

2. **Consumer Meat Behaviour and Store Chain Selection:**

   Household level meat purchase data from 2002 to 2007 and Neilson Media Measurement™ store level advertising expenditure data (1999-2005) are used in order to:

   a. Find out whether Canadian consumers show consistency in meat purchase patterns by store.
   b. Are households loyal to particular stores? Does this vary by region, by demographics, by store availability, is store advertising a factor?

3. **Consumer Meat Behaviour and National Brand versus Private Label Meat Products Selection:**

   Household level meat purchase panel data from 2002 to 2007 and Neilson Media Measurement™ advertising data (2002-2007) were estimated in order to:

   a. Identify how consumers make decisions about private label versus national brand products in their fully processed value added meat category.
   b. Is product and brand advertising a factor? Does behaviour vary regionally and by demographics?

Three types of meat purchasing decision making choices dominate in a considerable body of previous literature on household food at home meat demand: the choice of animal species, the choice of particular stores and the choice of particular brands. These choice analyses are usually examined independently without considering their impacts on each other. Moreover, to the knowledge of the author, very few studies have dealt with value added meat purchasing and its relationship with store and brand choices, in U.S. and Canada. Thus this study focuses on the household demographic characteristics that determine households' meat purchase behaviour by animal species, by level of processing, by store chains and by branding and whether there are significant differences or similarities across any of the three demand analyses.

7.2 Summary and Findings

ACNielsen Homescan™ panel was used as the primary data source for all the three meat purchasing analyses. In order to effectively address the aim of the study and better understand household purchase behaviour, habit formation and purchase history were taken into account in the estimation. In order to observe purchase behaviour changes and trends, households that have as long a purchase history as possible were used. A sample was selected accordingly for the empirical analyses consisting of the same households having meat purchases that stayed in the ACNielsen Homescan™ panel over the period 2002 to 2007. To conduct manageable analyses and comparisons, two typical regions in Canada, Ontario (the most populous province) and Alberta (significant in livestock production), were chosen in the study, resulting in a sample of 1,036 households in Ontario and 506 households in Alberta. The results of sample description statistics were provided in each demand analysis and compared to demographic data provided by Statistics Canada (Census 2006).

Not all households in the sample panel made meat purchases for all types of meat products or shopped at every grocery store chain in every period. In order to deal with these zero consumption issues, all household purchases were aggregated to annual expenditure levels, even so a few zero consumption occasions can still be observed. Thus a two step procedure was used to deal with censored dependent variables (zero consumption for each value added meat, each store meat expenditure and branded meat purchase). Heien and Wessell's (1990) two-step estimation procedure was applied in each of the three meat purchase analyses. In this procedure, households were assumed to follow a two step decision process, in which households first decided whether or not to participate in the purchase (buying meat or shopping at a store chain), and secondly the expenditure levels were determined for each meat product or at each store chain. In the first stage of the estimation the probability that a household makes a purchase decision (in the first meat choice model --- to purchase a particular one of twelve meat categories: fresh, semi-processed and fully processed beef, pork, poultry and other meats; in the second store choice model --- to purchase meat at a particular grocery store chain; in the third brand choice model --- to

purchase national or store brand (private label) pork, poultry or other meats) was estimated as a function of demographic variables and advertising expenditures using a Probit model. In the second stage of each model, expenditure shares are modelled as functions of demographic variables, time trend, habit formation, prices (when available) and advertising expenditures and the inverse mills ratios calculated from the first stage of the model. The inverse mills ratios in all three analyses for both regions were found to be statistically significant in the second stage regressions, indicating that the instrumental variables incorporating the censoring latent variables from the first stage should be accounted in the second stage estimation.

The best fitting models were selected by the popular likelihood ratio tests (LRT) in each of the three demand systems. For the first meat choice model, examination using LRT tests indicated that all the variables except for "households with children" variable should be retained in the final Working-Leser demand system in Ontario, while in Alberta all the variables should be retained in the final Working-Leser demand system (at 10 percent significance level). For the second store choice model, LRT tests showed that all the variables except for time trend and households with presence of children variables should be retained in the final Ontario Working-Leser demand system, while for the Alberta model, household income and time trend variables should be omitted in the final estimation (at 10 percent significance level). In the third brand choice models, LRT tests indicated that all the variables should be retained in the final LA/AIDS demand systems in both regions (at 10 percent significance level). The summary of all three analysis results, including the first stage marginal effects and factors affecting the second stage meat/store expenditure shares and expenditure elasticities is reported in Tables 7.1-7.3.

Table 7.1 Summary of Marginal Effects for First Stage Probit Estimation of Ontario and Alberta

Variables	***Constant***		***Total Exp***		***HHINC***		***HAGE***		***T***		***CHAINS***		***HHEDU1***		***KID1***		***URBAN***		***HHSIZE***		***Own AD***		***Other AD***	
	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB
Meat choices																								
fresh pork	-	N	+	+	N	N	+	+	N	-	+	+	N	N	N	N	-	N	N	-	N	N	N	N
fresh beef	N	N	+	+	-	N	+	+	N	-	+	+	N	N	+	-	+	+	-	-	N	N	N	N
fresh poultry	N	N	+	+	N	N	+	N	-	N	+	+	N	N	N	N	+	N	-	-	-	N	N	N
fresh others	-	-	+	+	N	+	+	N	+	N	+	+	N	N	N	N	+	+	+	N	N	N	+	N
semi-pork	-	-	+	+	N	N	+	N	+	+	+	+	N	-	N	N	-	N	N	N	N	+	N	+
semi-beef	-	-	+	+	-	N	N	+	+	-	+	+	N	N	N	-	-	N	N	N	n/a	n/a	N	N
semi-poultry	-	-	+	+	N	+	-	-	+	+	+	+	-	N	-	N	-	N	+	+	N	+	+	N
semi-others	-	N	+	+	N	N	N	N	-	-	+	+	-	N	N	N	N	N	+	N	N	N	+	N
fully-pork	-	-	+	+	+	N	+	+	N	N	+	+	-	-	N	N	-	-	+	+	-	N	N	+
fully-beef	-	-	+	+	N	N	+	+	N	+	+	+	+	N	N	N	-	N	+	N	N	N	N	-
fully-poultry	+	N	+	+	N	N	-	-	-	N	+	+	-	-	+	-	N	N	+	+	-	N	-	N
fully-others	-	-	+	+	N	N	N	N	+	+	+	+	+	-	+	N	N	N	+	+	N	N	N	N
Store choices																								
Co-op	N	-	-	N	N	-	N	+	N	N	+	+	N	N	N	-	N	-	N	+	N	N	N	N
Empire	-	-	+	+	-	-	+	N	N	N	+	+	N	-	N	N	-	-	-	N	N	N	N	N
Loblaw	-	-	+	N	+	N	N	N	-	N	+	+	N	N	N	N	-	-	N	N	+	N	+	N
Metro	-	n/a	N	n/a	-	n/a	N	n/a	N	n/a	+	n/a	+	n/a	N	n/a	+	n/a	-	n/a	N	n/a	N	n/a
JPG	n/a	-	n/a	+	n/a	N	n/a	N	n/a	N	n/a	+	n/a	+	n/a	N	n/a	+	n/a	-	n/a	N	n/a	N
Safeway	-	-	N	+	N	N	N	N	N	-	N	+	N	-	N	+	N	+	N	-	N	N	N	N
Others	-	-	-	-	+	+	-	-	+	+	+	+	-	N	N	-	+	-	+	+	-	N	N	N

Table 7.1 continued...

Variables	***Constant***		***Total Exp***		***HHINC***		***HAGE***		***T***		***CHAINS***		***HHEDU1***		***KID1***		***URBAN***		***HHSIZE***		***Own AD***		***Other AD***	
	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB
Brand choices																								
NB Pork	-	-	+	+	+	N	+	+	+	+	+	+	-	-	N	-	-	-	+	+	+	N	-	-
PL Pork	-	-	+	+	+	N	+	+	+	+	+	+	N	-	N	N	-	N	N	N	N	+	-	-
NB Poultry	N	-	+	+	N	N	-	N	-	N	+	+	-	N	N	N	N	N	+	+	+	N	-	N
PL Poultry	N	-	+	+	N	N	-	-	-	-	+	+	N	-	N	+	N	+	N	N	+	N	N	+
NB Others	-	-	+	+	-	N	+	N	+	N	+	+	+	-	+	N	N	+	+	N	N	N	-	N
PL Others	-	-	+	+	+	+	+	N	N	N	+	+	+	+	N	N	+	+	N	N	+	N	-	N

Note: "+" and "-" denote positive and negative sign of significant variables (at 10 percent significance level);

"N" denotes insignificant variables (at 10 percent significance level);

"n/a" denotes the variables are not available in the analysis;

NB=national brands, PL= private labels (store brands);

Total Exp, HHINC, HAGE, T, Chains, HHEDU1, KID1, URBAN, HHSIZE, Own AD, Other AD variables stand for total meat expenditure, household income, age, time trend, number of stores that a household shopped at, higher education, household with presence of children, urban dwellers, household size, own and other advertising expenditure.

Table 7.2 Summary of Second Stage Expenditure Estimation of Ontario and Alberta

Variables	Constant		Lagged Exp(-1)		IMR		CHAINS		KID1		HHINC		HHSIZE		URBAN		HAGE		HHEDU1		Own AD		Other AD		Total Exp	
	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB
Meat choices																										
fresh pork	N	-	+	+	+	+	+	N	n/a	N	-	-	-	N	-	N	+	+	N	-	-	-	N	N	-	+
fresh beef	N	N	+	+	+	+	-	-	n/a	N	-	-	-	-	N	+	N	N	N	+	N	N	+	-	N	+
fresh poultry	-	+	+	+	+	+	N	N	n/a	N	+	+	-	N	+	N	-	-	+	N	-	N	-	N	-	-
fresh others	N	+	+	+	+	+	+	+	n/a	N	N	+	+	N	+	+	+	N	N	N	N	N	+	+	-	-
semi-pork	N	-	+	+	+	+	N	N	n/a	N	N	N	N	N	-	N	+	N	-	N	-	+	-	+	-	-
semi-beef	+	N	+	+	+	+	+	+	n/a	+	-	N	N	N	N	+	N	+	N	N	n/a	N	+	+	-	-
semi-poultry	+	+	+	N	+	+	N	+	n/a	N	+	+	N	N	N	N	-	-	N	N	N	+	N	-	-	-
semi-others	+	N	+	+	+	+	N	+	n/a	N	-	N	+	+	N	N	N	N	N	N	N	N	N	N	-	-
fully-pork	+	N	+	+	+	+	N	N	n/a	-	+	N	N	+	-	-	+	+	-	-	-	N	N	N	-	-
fully-beef	N	+	+	+	+	+	N	+	n/a	N	N	-	+	+	N	N	+	-	N	N	N	N	N	-	-	-
fully-poultry	+	+	+	+	+	+	N	N	n/a	-	+	N	+	+	N	-	-	-	N	N	N	+	+	N	-	-
fully-others	N	N	-	-	-	-	N	-	n/a	N	N	+	+	N	N	N	N	+	N	N	N	-	N	N	+	+
Store choices																										
Co-op	+	N	+	+	+	+	N	-	n/a	N	N	n/a	N	+	N	N	N	+	N	+	N	N	N	N	-	N
Empire	+	+	+	+	+	+	+	-	n/a	N	-	n/a	N	N	-	-	N	-	-	-	+	N	-	N	-	-
Loblaw	+	+	+	+	+	+	-	-	n/a	N	+	n/a	+	+	-	N	N	N	N	+	+	N	+	+	+	-
Metro	+	n/a	+	n/a	+	n/a	N	n/a	n/a	n/a	-	n/a	-	n/a	+	n/a	-	n/a	+	n/a	N	n/a	-	n/a	-	n/a
JPG	n/a	N	n/a	+	n/a	+	n/a	N	n/a	N	n/a	n/a	n/a	N	n/a	+	n/a	+	n/a	+	n/a	N	n/a	N	n/a	-
Safeway	N	+	+	+	+	+	N	-	n/a	N	N	n/a	-	-	-	+	-	-	N	-	N	N	N	N	N	+
Others	N	N	-	-	-	-	+	+	n/a	-	+	n/a	+	+	+	-	+	N	N	N	-	N	+	N	+	+

Table 7.2 continued...

Variables	Constant		Lagged Exp(-1)		IMR		CHAINS		KID1		HHINC		HHSIZE		URBAN		HAGE		HHEDU1		Own AD		Other AD		Total Exp	
	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB
Brand choices																										
NB Pork	-	N	+	+	+	+	+	+	-	-	N	N	+	+	-	-	+	+	-	-	N	N	-	-	-	-
PL Pork	+	N	+	+	+	+	+	N	N	N	+	N	N	+	-	N	+	+	N	N	+	N	-	N	N	N
NB Poultry	+	+	+	+	+	+	+	+	+	-	N	-	N	+	+	-	-	-	-	+	+	N	N	N	-	+
PL Poultry	+	N	+	+	+	+	+	+	N	+	N	-	N	N	N	+	-	-	N	N	+	-	N	+	+	+
NB Others	N	-	+	+	+	+	+	+	+	+	-	N	N	-	N	+	+	+	+	N	-	N	-	+	-	-
PL Others	N	+	-	-	-	-	-	-	N	N	+	+	N	N	N	N	N	N	+	N	N	N	+	-	+	+

Note: "+" and "-" denote positive and negative sign of significant variables (at 10 percent significance level);
"N" denotes insignificant variables (at 10 percent significance level);
"n/a" denotes the variables are not available in the analysis;
NB = national brands, PL = private labels (store brands);
Total Exp, HHINC, HAGE, T, Chains, HHEDU1, KID1, URBAN, HHSIZE, Own AD, Other AD, Lagged Exp(-1), IMR variables stand for total meat expenditure, household income, age, time trend, number of stores that a household shopped at, higher education, household with presence of children, urban dwellers, household size, own and other advertising expenditure; and one year lagged meat expenditure for each meat/store, inverse mills ratio gained from the first stage Probit model;
Value added meat choice and store choice models were estimated by Working-leser demand system, Brand choice model was using LA/AIDS.

Table 7.3 Expenditure Elasticities Summary

	Ontario	*Alberta*		*Ontario*	*Alberta*
fresh pork	$+^{u}$	$+^{e}$	**NB Pork**	N	$+^{i}$
fresh beef	$+^{u}$	$+^{e}$	**PL Pork**	$+^{e}$	$+^{i}$
fresh poultry	$+^{i}$	$+^{i}$	**NB Poultry**	$+^{e}$	$+^{e}$
fresh others	$+^{i}$	N	**PL Poultry**	$+^{e}$	$+^{e}$
semi-pork	$+^{i}$	$+^{i}$	**NB Others**	$+^{i}$	$+^{i}$
semi-beef	$+^{i}$	$+^{i}$	**PL Others**	$+^{e}$	$+^{e}$
semi-poultry	N	N	**Co-op**	N	$+^{i}$
semi-others	N	N	**Empire**	$+^{i}$	$+^{i}$
fully-pork	N	N	**Loblaw**	$+^{e}$	$+^{i}$
fully-beef	N	$+^{i}$	**Metro**	$+^{i}$	n/a
fully-poultry	$+^{i}$	N	**JPG**	n/a	$+^{i}$
fully-others	$+^{e}$	$+^{e}$	**Safeway**	$+^{i}$	$+^{e}$
			Others	$+^{e}$	$+^{e}$

Note: "+" and "-" denote positive and negative sign of significant variables (at 10 percent significance level);
"N" denotes insignificant variables (at 10 percent significance level);
"n/a" denotes the variables are not available in the analysis;
e, u, i denote elastic, unity elastic and inelastic expenditure elasticities
NB = national brands, PL = private labels (store brands).

7.2.1 Meat Purchase Behaviour and Level of Meat Processing

For the first analysis of meat by type, meat products were grouped into four major animal species categories, namely pork, beef, poultry and others (mainly seafood products), which were then divided into three main levels of processing: fresh, semi-processed and fully processed forms. Fresh meats were classified as those to which minimal processing had been applied. Semi-processed meats were identified as those to which some level of further processing had been applied (e.g. sauces, flavourings, etc.), but for which kitchen processing and/or cooking would still be required. The fully processed meat category was classified as the products for which no further cooking or processing is needed and ready to eat/heat (e.g. ham, etc.) or in other cases implies that the product has had more than one type of processing applied (breaded formed chicken nuggets, for example) although some extent of cooking is still required. Meal/dinner type items would be included in the fully processed category. Thus twelve meat categories were created to address the objectives of the first study.

In the sample, fresh meat purchases are the largest meat expenditure category, ranging from approximately 70 percent of meat expenditures in Ontario to over 75 percent of meat expenditures in Alberta. Semi-processed meats only represent 11 percent of meat expenditures in Ontario and 6 percent of meat expenditures in Alberta on average. Fully processed meat products average over 20 percent of meat expenditures in Ontario while they average 19 percent of meat expenditures in Alberta, increasing from 15 percent in 2002 to 19 percent in 2007. By animal species, beef continues to be the largest meat category ranging from 32 to 38 percent in Alberta and from 30 to 33 percent of total meat expenditure in Ontario. Poultry expenditures are the second largest meat category in both regions, ranging from 29 to 32 percent in Alberta and averaging 34 percent in Ontario. Pork expenditures range from 20 to 25 percent in Alberta and 20 to 22 percent in Ontario for the period 2002 to 2007. In each province semi-/fully processed beef expenditure shares are the smallest of the twelve meat categories, reflecting the lower number of semi-/fully processed beef products available in the market. There is also an interesting finding that the fully processed meat expenditure share of the total meat expenditure has been

increasing while the fresh meat category has been slightly decreasing over time in both regions.

As reported in Table 7.1, the first stage model for the decision of whether or not to purchase each of the twelve fresh, semi-processed or fully processed meat products can be summarized in terms of signs and significance across the two regions. In general, older household heads are more likely to purchase fresh/fully processed pork and beef but less likely to purchase semi-/fully processed poultry products. Better educated household heads are associated with lower probabilities of purchasing fully processed pork and poultry in Ontario and Alberta. As household sizes increase there is a greater probability of purchasing all four fully processed meat products in Ontario and fully processed pork, poultry and other meats in Alberta. Over time semi-processed pork and poultry and fully processed other meats have a higher probability of being selected.

In terms of factors that explain the level of expenditures on each of the twelve meat categories, most of the coefficients on lagged meat expenditure have statistically significant and positive impacts, indicating that past consumption is quite significant in explaining current meat purchase behaviour. Both regions show that younger household heads with higher incomes were more likely to spend more on fresh and semi-processed poultry; older rural dwellers were more likely to purchase fully processed pork products as well. As household sizes increase, more purchases of semi-processed other meats, fully processed beef and poultry products, fewer purchases of fresh pork and beef products occur. As shown in Table 7.3, the expenditure elasticity for fresh beef was around one in Ontario, as compared to fresh beef in Alberta being slightly larger than one. Expenditure elasticities for fresh poultry, semi-processed pork and beef meat categories in both regions were less than one indicating that those meat products are expenditure inelastic and households may already regard the products as necessary goods rather than luxury goods.

7.2.2 Meat Purchase Behaviour and Store Selection

According to store expenditure shares in the sample panel, six grocery chains in each province (Ontario and Alberta) were selected for the store choice analysis. In Ontario, the six grocery chains include Loblaw, Metro, Safeway, Co-op, Empire (e.g. Sobeys, etc.), and all others. In Alberta, the six grocery chains are Loblaw, Safeway, Co-op, Empire, JPG (e.g. Save On Foods) and all others. Empire, Loblaw, Safeway, and Co-op are used in both provincial store choice models and this enables comparison across provinces. Loblaw has the largest market share in Ontario, averaging at 50 percent. The second largest store chain in Ontario is Metro, followed by Empire. In Alberta, the largest store chain in market share is Safeway, and Loblaw in Alberta has been gaining market share, increasing from 15 percent in 2002 to 23 percent in 2007.

The number of store chains that a household shopped at is also calculated on an annual basis and interestingly it shows that the vast majority of households do not have much store loyalty[7]. Most households in the ACNielsen Homescan™ panel purchase meat at more than one store chain and visit two to four store chains on a somewhat regular basis in both regions. In Ontario, households who spend more on total meat were more likely to shop at Empire and Loblaw and were less likely to shop at Co-op and other store chains. Over time fewer households were choosing to purchase meat at Loblaw, and more households seemed to shop at "other store chains" in Ontario. This could be explained by the competitive retailing environment in Ontario as more new grocery store chains (e.g. Wal-Mart, Costco, etc.) are entering the market and possibly gaining store expenditure share in Ontario. Alberta households with higher meat expenditures were more likely to spend that money at Empire, JPG and Safeway store chains. Alberta urban dwellers with larger household sizes were less likely to purchase meat at JPG and Safeway. Over time few households were choosing to purchase meat at Safeway, and more households were purchasing at other stores, indicating that other grocery chains were gaining more meat purchasers, the phenomenon was also observed from the sample statistics.

[7] Store loyalty means purchasing meat products regularly at the same grocery store chain.

The significant explanatory variables for the decision on the level of spending on meat at each grocery store chain also vary across provinces. The number of grocery store chains that a household shopped at is a significant determinant of the level of meat spending at Empire and Other stores in Ontario. However in Alberta the number of chains that a household shopped at is negatively related to the level of spending at all stores except for JPG and "other store chains". Total meat expenditure at each of the grocery store chains is shown to be a statistically significant determinant of the level of meat spending at all chains in both regions except for Safeway in Ontario and Co-op in Alberta. In Ontario better educated households tend to have larger store meat expenditures at Metro but fewer meat purchases at Empire. In Alberta, better educated households with larger household sizes spent more at Loblaw. Urban dwellers spent less on meat at Empire in Ontario and Alberta. Older Alberta household heads had larger meat expenditures at Co-op and JPG store chains, probably due to these traditional store availability in Alberta. Higher income households in Ontario spent more at Loblaw and other store chains and spent less at Empire and Metro. Own store advertising is found to have statistically significant and positive effects for Loblaw and Metro store chains in Ontario.

7.2.3 Meat Purchasing and National Brand/Private Label Choices

For the third branded meat choice analysis, the households' decisions to purchase national brand/private label meat products were the focus of the analysis. Due to the fact that most of the fully processed meat products (except for pork category, which are mostly random weighted ham products) are UPC coded products, which can offer detailed brand information (e.g. product quantities, brands, manufactures, etc.), while most of the fresh and semi-processed meat products are random weighted and generic which do not have brand/company information, only fully processed meat products were considered. Thus fully processed branded meat products (except for beef, due to its small market share) were analysed in this section and meat products were grouped into six brand categories: (1) national brand pork, poultry and others (mainly seafood); (2) store brand pork, poultry and others (mainly seafood). National brand other meat

category had the largest meat expenditure share, averaging 29 percent in Ontario and 33 percent in Alberta.

Marginal effects from the first stage of the national versus store brand choice models suggest that the decision of brand choices is significantly affected by household demographic characteristics in Ontario and Alberta. In Ontario and Alberta, the effects of total meat expenditure and the number of chains that a household shopped at were all statistically significant and positive, indicating that the more store chains that a household shopped at, the higher the probability was to purchase both types of branded meat products. Household incomes are seen to have positive and statistically significant effects on national brand pork, store brand pork and other meats purchasing possibilities in Ontario and store brand other meats purchasing possibilities in Alberta.

Different from previous estimation procedures, the linear approximate almost ideal demand system (LA/AIDS) estimation method was used in the second stage of the estimation explaining the level of expenditures on branded meat due to the price availability. All the inverse mills ratios in both regions were found to be statistically significant in the regressions, indicating that the instrumental variables should be accounted for the sample selection bias in the second stage. Results showed that younger household heads in both regions were less likely to spend more on national and store brand poultry, more likely to spend more on national brand pork and other meat, and store brand pork. Larger households in Ontario and Alberta were more likely to purchase national brand pork. In Ontario higher income levels were associated with lower expenditure shares for national brand other meats. In Alberta higher incomes are only associated with lower spending on national and store brand poultry products.

7.2.4 Impacts of Demographic Variables and Advertising Expenditures

Comparisons of all three meat and store purchase models are presented in this section (shown as in Table 7.1), identifying the similarities and differences in the impacts of socioeconomics and household demographics on household meat purchase behaviour.

1. Results from the first stage of all three models suggest that:

Total meat expenditure: in Ontario and Alberta, the effects of total meat expenditures have positive and statistically significant impacts on the probability of purchasing all meat types by different processing levels and brands. Households spending more on meat are more likely to shop at Empire and less likely to shop at "other chains";

Household income: in Ontario and Alberta household incomes have little relationship with the probabilities of meat purchasing in most of the three models. Higher income households are more likely to choose fresh other meat and semi-processed poultry products in Alberta and fully processed pork in Ontario. For brand choices, household incomes have little impacts on the probabilities of purchasing branded meat products in Alberta;

Household age: in Ontario and Alberta older households that are more likely to purchase fresh/fully processed pork and beef products are not influenced by brands, and less likely to shop at other store chains;

Time trend: Ontario and Alberta households are more likely to purchase semi-processed pork/poultry and fully processed other meat over time; and there is a tendency that households are more likely to shop at "other store chains" in both regions;

The number of store chains that a household shopped at: significantly and positively affected meat purchase probabilities in all three analyses;

Household head education: better educated households in Ontario and Alberta are less likely to purchase fully processed pork and poultry products, while they are more likely to purchase store brand other meats;

Households with children: has little relationship with probabilities of making meat choice, store choice and brand choice decisions in most of the cases in both regions;

Urban residing: residing in urban rather than rural areas has little relationship with purchasing probabilities in store choices;

Household size: larger households in both Ontario and Alberta are more likely to purchase national brand pork and poultry products, and more likely to shop at other store chains;

Advertising: in Ontario, own advertising expenditures have statistically significant and positive impacts on the probabilities of choosing to shop at Loblaw and to purchase national brand pork and poultry and private label other meats. In Alberta, own advertising expenditures have statistically significant and positive impacts on the probabilities of choosing to purchase semi-processed pork and poultry and private label pork products.

2. In the second stage demand systems explaining the level of expenditures for each of the twelve meat products, store expenditure and national/store brand meat products, results from the second stage of all three models show that:

Lagged expenditure: all the lagged meat expenditure variables (except for semi-processed poultry and private label pork purchases in Alberta) had statistically significant impacts on meat expenditure shares and store meat expenditures in both regions, indicating that past consumption is quite significant in explaining current meat purchase behaviour.

Inverse Mills Ratio: it was noticeable that the inverse mills ratios in both regions were found to be statistically significant in all of the regressions, indicating that the instrumental variables incorporating the censoring latent variables from the first stage should be accounted in the second-stage estimation.

The number of store chains that a household shopped at: statistically significant and positively affects branded meat products in both regions (except for private label pork in Alberta, and private label other meats in both regions), and has statistically significant and negative impacts on meat purchases at Loblaw in both regions;

Households with children: in both regions, households with children are spending more on national brand other meats and spending less on national brand pork products, it has little relationship with impacts on store choices;

Household income: households in Ontario and Alberta with higher incomes are spending more on fresh/semi-processed poultry and spending less on fresh beef/pork products, household incomes are observed to have little impacts on store choices in Alberta; households with higher incomes are spending more on private label pork and other meat products in Ontario and spending less on branded poultry products in Alberta;

Household size: larger households in both Ontario and Alberta are spending more on semi-processed other meats, fully processed beef and poultry products and spending less on fresh pork and beef products; it can be observed that larger households are spending more on meat at Loblaw and other stores and spending less on Safeway in both regions, it might be explained by the fact that the price level at Loblaw is somewhat lower than that in Safeway in both regions;

Urban residing: residing in urban rather than rural areas has little relationship with purchasing semi-processed poultry and other meats and fully processed beef and other meats in both regions, urban dwellers are spending less on meat at Empire in both regions as well;

Household age: in Ontario and Alberta older households are spending more on fresh/fully processed pork, and spending less on fresh, semi-/fully processed poultry; while the household age has little impacts on store choices in both regions, except that younger household heads are spending more at Safeway; and older households are spending more on branded pork and national brand other meats, and spending less on branded poultry products in both regions;

Household head education: it is noticeable that the household head education level has little impacts on meat type choices in most of the cases in both regions, except that better educated household heads are spending less on fully processed pork; better educated households in Ontario and Alberta are spending less at Empire store chains;

Advertising: in Ontario, own advertising expenditures have statistically significant and positive impacts on the purchases of private label pork and branded poultry products, and on the store expenditures at Loblaw and Metro. In Alberta, own advertising expenditures have statistically significant and positive impacts on the purchases of fresh pork, semi-processed pork and beef products;

Total meat expenditure: in Ontario and Alberta, the effects of total meat expenditure have a positive and significant impacts on purchases of private label poultry and other meat products;

The elasticities for each analysis are calculated at the sample means of explanatory variables in the study. The expenditure elasticities summary (Table 7.3) for all the studies shows that all meat/store expenditure elasticities, when statistically significant (at 10 percent significance level), had the expected positive signs. It was observed that there were some differences between the various types of processed and branded meat products.

7.3 Conclusions and Implications

Three different meat purchase studies have been summarized. Significant variability in the markets for meat products, by animal species, by level of processing, by branding and household purchases of meat by grocery store chains across provinces can be observed from the estimation. The common finding in all of the studies is that there are significant demographic differences in household purchases of meat products across provinces (Tables 7.4-7.5). The results indicated that there is no one correct pattern of meat product development across animal products from different species. There are clearly much higher numbers of pork and poultry semi-processed and fully processed products available than there are for beef. For example, households with higher incomes in Ontario were spending less on semi-processed beef and other meats, while these in Alberta were spending less on fully processed beef, but both regions showed that there was a strong relationship between increasing incomes and fresh/semi-processed poultry expenditures. The number of store chains that a household shopped at, representing to some extent store loyalty, does not appear to have an impact on fully processed pork and poultry preferences for Ontario and Alberta households.

Grocery store meat purchases exhibit little store loyalty – most households purchase meat at more than one store chain. The number of store chains that a household shopped at does not appear to have an impact on Co-op, Metro and Safeway choices for Ontario households, while in Alberta, it has a statistically significant impact on all store chains except for JPG. Consumers also differ considerably in the level of spending on national brand and private label products. For some meat products, store brand and private label products are expanding in household preferences while in others they seem to be contracting – these results seem to be animal specific or firm specific since there are relatively few processors for each animal species within Canada. Habit-formation effects can also be identified in all the branded meat spending levels in Ontario and Alberta households.

The implications of the study can be used for the food industry in general and meat industry to expand sales by targeting marketing strategies. The results of this study suggest the importance of meat marketing segmentation by socioeconomic and household demographic factors. Identification of the major determinants of each meat product segment is a prerequisite in the development of marketing programs, new product development and product promotion. The results indicated that household demographic characteristics play an important role in determining meat spending by different processing levels, by store chains and by branding. The industry has to take into account differences across individuals to get the most out of its marketing programs. For example, the store choice analysis indicated that households had little store brand loyalty as most of the households regularly shopped at two to four grocery store chains to buy meat. The implication of this finding suggests that for meat manufacturers, when they develop new products, it may be beneficial to cooperate with more than one store chain to get the potential maximum sales.

Table 7.4 Summary of the findings for Ontario, 2002-2007

Meat/store	*Ave. exp.*[a]	*Ave. Ad*[b]	*Own Price Elas.*	*Exp Elas.*	*Own Ad*	*Characteristics of HH who buy*
Fresh pork	51	1.73	N	Unit elastic	Significant	Older rural dwellers with lower incomes and smaller household sizes
Fresh beef	104	1.29	N	Unit elastic	N	Household heads with lower incomes and smaller household sizes
Fresh poultry	86	8.25	N	Inelastic	Significant	Younger urban dwellers with higher incomes, smaller household sizes, better education
Fresh others	31	0.38	N	Inelastic	N	Older urban dwellers with larger household sizes
Semi-pork	29	0.47	N	Inelastic	Significant	Older rural dwellers with lower education
Semi-beef	14	0.00	Elastic	Inelastic	N	Households with lower incomes
Semi-poultry	20	0.04	Elastic	N	N	Younger households with higher incomes
Semi-others	16	0.21	Elastic	N	N	Larger sized households with lower incomes
Fully-pork	21	3.59	Elastic	N	Significant	Older rural dwellers with lower education and higher incomes
Fully-beef	12	0.07	N	N	N	Older households with larger household sizes
Fully-poultry	38	1.32	N	Inelastic	N	Younger households with higher incomes and larger household sizes
Fully-others	36	1.18	N	Elastic	N	Households with larger household sizes
Co-op	19	1.90	N/A	N	N	All households
Empire	101	8.60	N/A	Inelastic	Significant	Rural dwellers with lower incomes and educations
Loblaw	171	9.55	N/A	Elastic	Significant	Rural dwellers with higher incomes and larger household sizes
Metro	124	5.51	N/A	Inelastic	N	Younger urban dwellers with lower incomes, smaller household sizes, better education
Safeway	115	14.17	N/A	Inelastic	N	Younger rural dwellers with smaller household sizes
Others	40	27.28	N/A	Elastic	Significant	Older urban dwellers with larger household sizes and higher incomes
NB pork	19	2.88	Elastic	N	N	Older rural dwellers with lower education and larger household sizes, without children
PL pork	16	0.75	Elastic	Unit elastic	Significant	Older rural dwellers with higher incomes
NB poultry	26	4.75	Elastic	Inelastic	Significant	Younger urban dwellers with lower incomes, with children
PL poultry	38	0.40	Inelastic	Elastic	Significant	Younger households
NB others	31	1.56	Inelastic	Inelastic	Significant	Older households with larger household sizes
PL others	30	0.11	Elastic	Elastic	N	Households with higher incomes and education

Note: N denotes insignificant at 10 percentage level or better. a. average expenditure is measured in Can $, b. average advertising expenditure is measured in millions of Canadian $.

Table 7.5 Summary of the findings for Alberta, 2002-2007

Meat/store	*Ave. exp.*[a]	*Ave. Ad*[b]	*Own Price Elas.*	*Exp Elas.*	*Own Ad*	*Characteristics of HH who buy*
Fresh pork	69	1.73	N	Elastic	Significant	Older households with lower incomes
Fresh beef	128	1.29	N	Elastic	N	Urban dwellers with better education, lower incomes and smaller household sizes
Fresh poultry	89	8.25	Elastic	Inelastic	N	Younger households with higher incomes
Fresh others	28	0.38	Elastic	N	N	Urban dwellers with higher incomes
Semi-pork	19	0.47	N	Inelastic	Significant	All households
Semi-beef	14	0.00	Elastic	Inelastic	N	Older urban dwellers with children
Semi-poultry	18	0.04	N	N	Significant	Younger households with higher incomes
Semi-others	13	0.21	N	N	N	Households with larger household sizes
Fully-pork	27	3.59	N	N	N	Older rural dwellers with lower education and larger household sizes, without children
Fully-beef	11	0.07	N	Inelastic	N	Younger households with lower incomes
Fully-poultry	37	1.32	Elastic	N	Significant	Younger rural dwellers with larger household sizes
Fully-others	34	1.18	N	Elastic	Significant	Older households with higher incomes
Co-op	152	1.90	N/A	Inelastic	N	Older households with better education and large household sizes
Empire	107	8.60	N/A	Inelastic	N	Younger rural dwellers with lower education
Jpg	80	4.71	N/A	Inelastic	N	Older urban dwellers with higher education
Loblaw	106	9.55	N/A	Inelastic	N	Households with larger household sizes and higher education
Safeway	179	14.17	N/A	Elastic	N	Younger urban dwellers with smaller household sizes and lower education
Others	44	28.08	N/A	Elastic	N	Rural dwellers with larger household sizes
NB pork	20	2.88	Unit elastic	Inelastic	N	Older rural dwellers with lower education and larger household sizes, without children
PL pork	20	0.75	N	Inelastic	N	Older household heads with larger household sizes
NB poultry	31	4.75	Elastic	Elastic	N	Younger rural dwellers with higher education, larger household sizes, lower incomes without children
PL poultry	36	0.40	Unit elastic	Elastic	Significant	Younger urban dwellers with lower incomes and children
NB others	34	1.56	N	Inelastic	N	Older urban dwellers with smaller household sizes, and with children
PL others	24	0.11	Unit elastic	Elastic	N	Households with higher incomes

Note: N denotes insignificant at 10 percentage level or better. a. average expenditure is measured in Can $, b. average advertising expenditure is measured in millions of Canadian $.

7.4 Limitations and Recommendations for Future Research

A two-stage Heckman procedure described in Heien and Wessells (1990) was conducted in the study to account for censoring and potential sample selection biases. This approach has been put into question by Shonkwiler and Yen (1999). Tauchmann (2005) prefers Heckman procedure in empirical analysis using Monte-Carlo simulations. Future research could apply both Heien and Wessells (1990)'s and Shonkwiler and Yen (1999)'s methods or use Monte-Carlo simulations' two stage censoring procedure to make the comparison in order to improve model fitting and prediction.

A weakness of this sample data is the lack of meat prices at the household level in both regions. These additional data would make it possible to apply the traditional approaches of consumer demand theory that consumers' meat demand is affected by the prices of the products. Demographic variables used in this study contain household size, household income, urban, households with presence of children, household head age, education, etc. For some of them, like household educations, household with presence of children, etc are dummy variables (e.g. for KID, 1 if HH with children, 0 otherwise). In the future studies, more specific demographic information could be applied to the analysis to capture more detailed impacts. For example, the dummy variable for demographic variables could be created to represent no high school education, high school education, some college education and university education. And the household with children variable could be more specific in the model, for example, more dummy variables could be created to denote with children in different age groups, such as age of 1-6, 6-12, 12-17, over 18 ages, etc. And the panel data used in the study were balanced data which contained the same households that stayed in the panel over the period from 2002 to 2007. Due to the characteristics of the balanced data, the demographics of the households in the panel tended to be better educated and older household heads, which may not represent the households residing in Ontario and Alberta from those reported by Statistics Canada over the study period, future research may try to include all the

households that are in the panel and could also include all the regions, not only Alberta and Ontario, and conduct a cross-sectional analysis which could produce more specific regional difference comparisons. Longer study periods and year by year comparisons to capture the overtime changes could also be applied in future studies, 2001-2008, for example. Other worthwhile investigations would be possible for future studies are:

-Disaggregation of more individual products by national brands and store brands;

-Choose more grocery chains from different regions in Canada and make comparisons; and bring in the store chains' own characteristics (e.g. number of stores, store availability, distance, store format. etc.) in the estimation;

-Further investigate the hierarchy of the consumer purchase decision making process, test the structure of decision making, for example, will the consumer choose a certain grocery store chain first and then make the meat type choice decision in-store? Or will they first make the decision of what types or brands of meat products they will purchase and then select stores selling those products?;

-Further discuss the relationship between store loyalty and store brands, would store brand loyal households tend to shop at one grocery store chain that carry that store brand products;

-Discuss other factors that might affect the value added meat demand, like health issues, food safety, such as BSE, Avian Flu, foot-and-mouth, E. coli O157, etc.;

- Different model specifications by estimation for a wider variety of value added meat products;

- Further analyses of the impacts of new value added meat product introductions into the marketplace –do they successfully replace current products, or why do some not succeed?

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Appendix (A): Store Chains and Store Banners

In the second store choice analysis, store banners in Ontario and Alberta were aggregated to six major store chains, Co-op, Metro, Empire (e.g. Sobeys), Loblaw, Safeway, and “all others” in Ontario, and Co-op, JPG, Empire (e.g. Sobeys), Loblaw, Safeway and “all others” in Alberta. A review of the major grocery chains and the detailed store banners for each store chain will be discussed in this section.

1. Loblaw Companies Limited

Loblaw is Canada's largest grocery retailer with more than 1,000 corporate and franchised stores in Canada. "President's Choice" and "No Name" are the two major store brands/control labels of Loblaw. Other store brands include Club Pack, EXACT, Joe, Life @ home, PC Blue Menu, PC Mini Chefs, President's Choice Organics, Teddy's Choice, etc. Loblaw had a sale of 30 billion dollars in 2009. Loblaw Companies’ major banners include Atlantic SaveEasy, Atlantic Superstore, Extra Foods, Foodland, Fortinos, Loblaws, Maxi, No Frills, Provigo, Real Canadian Superstore, Real Canadian Wholesale Club, SuperValu, Valumart, Your Independent Grocer and Zehrs, etc..

Loblaw's store banners in 2009:

(Source: Loblaw 2009 Annual Report, http://www.loblaw.ca/en/pdf_en/lcl09_arfull_en.pdf, accessed on June 1st, 2010)

Table A.1 Loblaw's major store banners in Ontario and Alberta 2001-2009

Store banner	Extra Foods		Fortinos		Loblaws Supermarkets		Lucky Dollar Foods		No frills	
Year	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB
2001	**n/a**	**n/a**	**19**		**69**		**n/a**	**n/a**	**102**	
2002	**n/a**	**n/a**	**19**		**70**		**3**	**n/a**	**103**	
2003	**4**	**31**	**18**		**67**		**2**	**10**	**110**	
2004	**4**	**34**	**20**		**66**		**1**	**10**	**115**	
2005	**4**	**34**	**21**		**61**		**n/a**	**n/a**	**124**	
2006	**n/a**	**n/a**	**n/a**		**61**		**n/a**	**n/a**	**130**	
2007	**4**	**38**	**20**		**52**		**n/a**	**n/a**	**136**	
2008	**4**	**38**	**20**		**52**		**n/a**	**n/a**	**136**	
2009	**4**	**27**	**20**		**44**		**1**	**5**	**151**	
Ave sale/sq.ft/year	**$500-1000**		**$500-1000**		**$500-1000**		**$500-1000**		**$500-1000**	
Location types & avg. size	**SC 30,500 sq.ft**		**SC FR SP 30,500 sq.ft**		**SC FR 12,000 sq.ft**		**FR 10,500**		**SC PC 30,500 sq.ft**	
First open in Canada	**1980**		**1961**		**1920**		**1980**		**1978**	
Merchandise price category	**Discount**		**Medium**		**Medium**		**Discount**		**Discount**	

Table A.1 continues...

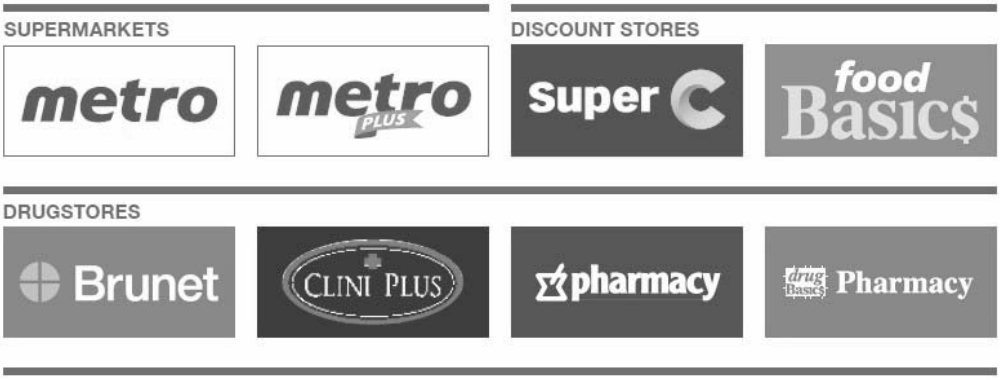
Store banner	Real Canadian Superstore		Real Canadian Wholesale Club		Shop Easy Foods		Value Mart		Your Independent Grocer		Zehrs	
Year	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB	ON	AB
2001	**1**	**18**	**2**	**7**	**n/a**	**n/a**	**70**		**51**		**58**	
2002	**1**	**19**	**2**	**7**	**2**	**n/a**	**72**		**52**		**59**	
2003	**1**	**20**	**2**	**7**	**3**	**6**	**71**		**54**		**58**	
2004	**1**	**20**	**2**	**7**	**2**	**10**	**70**		**52**		**59**	
2005	**14**	**21**	**7**	**7**	**2**	**9**	**70**		**49**		**55**	
2006	**n/a**	**n/a**	**n/a**	**n/a**	**2**	**9**	**68**		**51**		**52**	
2007	**31**	**25**	**8**	**7**	**2**	**9**	**68**		**54**		**49**	
2008	**31**	**25**	**8**	**7**	**2**	**9**	**68**		**54**		**49**	
2009	**38**	**27**	**8**	**7**	**0**	**7**	**62**		**54**		**45**	
Ave sale/sq.ft/year	**$500-1000**		**$500-1000**		**$500-1000**		**$500-1000**		**$500-1000**		**$500-1000**	
Location types & avg. size	**SC PC 30,500 sq.ft**		**SC 30,500 sq.ft**		**AD FR**		**FR 15,000 sq.ft**		**FR 15,000 sq.ft**		**SC FR SP 40,000 sq.ft**	
First open in Canada	**1980**		**1991**		**1912**		**1925**		**1987**		**1950**	
Merchandise price category	**Discount**		**Discount**		**Discount**		**Medium**		**Medium**		**Medium**	

(Source: Directory of Retail Chains in Canada 2002-2010, Monday Report on Retailers.
Note: 1. Ave.sale/Sq.Ft./Year indicates average sales per square foot per year for Canadian chains.
2. Location types & avg. size indicates the type of location the chain operates in, and the chain's average size; FR: freestanding/streetfront; SC: shopping centre; SP: strip plaza; PC: power center)

2. Metro

Metro Inc. operates more than 550 supermarkets and discount stores in Ontario and Quebec in 2009, which is the second largest grocery retailer in Ontario and Quebec only behind Loblaw. Metro Inc banners include Metro, Metro Plus, Food Basics, A&P Canada, Loeb Plus, and Super C banner stores. The store brands include Basics for Less, Equality, Grat Basics Finds, Master Choice, Simply Kids, Econochoix, Selection, etc..

Metro's store banners in 2009:



(Source: Metro 2009 Annual Report, http://www.metro.ca/userfiles/File/PDF_corpo/7200D%20RA09_A.pdf, accessed on June 1st, 2010)

Table A.2 Metro's major store banners in Ontario and Alberta 2001-2009

Store banner	**LOEB**		**Super C**		**A & P**		**Food Basics**	
Year	ON	AB	ON	AB	ON	AB	ON	AB
2001	**45**		**1**		**77**		**99**	
2002	**44**		**2**		**72**		**86**	
2003	**41**		**4**		**72**		**86**	
2004	**39**		**7**		**72**		**100**	
2005	**38**		**17**		**78**		**100**	
2006	**39**		**na**		**68**		**100**	
2007	**39**		**na**		**68**		**115**	
2008	**n/a**		**n/a**		**n/a**		**n/a**	
2009	**n/a**		**n/a**		**n/a**		**n/a**	
Ave sale/sq.ft/year	**$500-1000**		**$500-1000**		**$250-500**		**$250-500**	
Location types & avg. size	**FR SC SP 32,800 sq.ft**		**FR SC SP 32,800 sq.ft**		**FR SC SP**		**SC 32,175 sq.ft**	
First open in Canada	**1912**		**1983**		**1927**		**1995**	
Merchandise price category	**Discount**		**Discount**		**Medium**		**Discount**	

(Source: Directory of Retail Chains in Canada 2002-2010, Monday Report on Retailers.
Note: 1. Ave.sale/Sq.Ft./Year indicates average sales per square foot per year for Canadian chains.
2. Location types & avg. size indicates the type of location the chain operates in, and the chain's average size; FR: freestanding/streetfront; SC: shopping centre; SP: strip plaza; PC: power center)

3. Empire (Sobeys)

Sobeys Inc. is a wholly-owned subsidiary of Empire Company Limited. Sobeys is the second largest food retailer in Canada, with over 1300 grocery stores across the country. The Sobeys chain is divided into four regions; namely, Western Canada, Ontario, Quebec and Atlantic regions. Empire's banners are Sobeys, IGA, IGA Extra, Food Land, Food Town, Thrifty Foods, Price Chopper, Sobeys Express, Bonichoix, and Commisso's. Compliments is its private label.

Empire's (Sobeys) store banners in 2009:

(Source: Empire 2009 Annual Report, http://www.sobeyscorporate.com/App_Themes/SobeysCorporate/media/en/Empire_AR_09_ENG.pdf, accessed on June 1st, 2010)

Table A.3 Empire's major store banners in Ontario and Alberta 2001-2009

Store banner	**Foodland**		**IGA**		**Price Chopper**		**Sobeys**	
Year	ON	AB	ON	AB	ON	AB	ON	AB
2001	**43**		**n/a**	**142**	**22**		**34**	**n/a**
2002	**NA**		**NA**	**106**	**88**		**NA**	**n/a**
2003	**55**		**n/a**	**80**	**71**		**NA**	**57**
2004	**98**		**n/a**	**n/a**	**81**		**65**	**31**
2005	**93**		**115**	**63**	**83**		**66**	**46**
2006	**88**		**105**	**na**	**89**		**67**	**46**
2007	**107**		**77**	**28**	**96**		**86**	**52**
2008	**76**		**49**	**53**	**96**		**86**	**52**
2009	**153**		**n/a**	**44**	**91**		**94**	**61**
Ave sale/sq.ft/year	**$250-500**		**$500-1000**		**$250-500**		**$250-500**	
Location types & avg. size	**SC FR 9,000 sq.ft**		**SC FR SP 17,500 sq.ft**		**SC FR SP 24,000 sq.ft**		**SC FR SP 39,000 sq.ft**	
First open in Canada	**1948**		**1951**		**1992**		**1907**	
Merchandise price category	**Medium**		**Medium-Upper**		**Discount**		**Medium-Upper**	

(Source: Directory of Retail Chains in Canada 2002-2010, Monday Report on Retailers.
Note: 1. Ave.sale/Sq.Ft./Year indicates average sales per square foot per year for Canadian chains.
2. Location types & avg. size indicates the type of location the chain operates in, and the chain's average size; FR: freestanding/streetfront; SC: shopping centre; SP: strip plaza; PC: power center)

4. JPG (Save-On-Foods)

Save-On-Foods is part of the Overwaitea Food Group which is owned by the Jim Pattison Group. Save-On-Foods operates 53 stores in British Columbia and 24 in Alberta. Overwaitea Food Group's (by the Jim Pattison Group) store chains include Overwaitea, Cooper's Foods, Price Smart Foods and Save-On-Foods. Western Family, Value Priced, Western Classics are Save-On-Foods' private labels.

(Source: Save-On-Foods website, http://www.saveonfoods.com/aboutus/index.html, accessed on June 1st, 2010)

Table A.4 JPG's major store banners in Ontario and Alberta 2001-2009

Store banner	**Save on Foods**	
Year	ON	AB
2001		**13**
2002		**14**
2003		**15**
2004		**17**
2005		**17**
2006		**18**
2007		**18**
2008		**20**
2009		**22**
Ave sale/sq.ft/year	**$500-1000**	
Location types & avg. size	**SC 45,000 sq.ft**	
First open in Canada	**1982**	
Merchandise price category	**Medium**	

(Source: Directory of Retail Chains in Canada 2002-2010, Monday Report on Retailers.
Note: 1. Ave.sale/Sq.Ft./Year indicates average sales per square foot per year for Canadian chains.
2. Location types & avg. size indicates the type of location the chain operates in, and the chain's average size; FR: freestanding/streetfront; SC: shopping centre; SP: strip plaza; PC: power center)

5. Co-op

Federated Co-op is the leading retail co-op in Canada which is owned by the member co-operatives across the region with approximately 300 retail locations. Some large co-operatives include Saskatoon Co-op and Calgary Co-op, etc.

(Source: FCL2009 Annual Report, http://xp1.fcl.ca/wps/wcm/connect/9db7ec004205a0c08c21cec8af4a77c5/FCL_Annual-Report_09.pdf?MOD=AJPERES, accessed on June 1st, 2010)

Table A.5 Co-op's major store banners in Ontario and Alberta 2001-2009

Store banner	**Calgary Co-op**	
Year	ON	AB
2001		**19**
2002		**19**
2003		**18**
2004		**18**
2005		**21**
2006		**21**
2007		**21**
2008		**21**
2009		**22**
Ave sale/sq.ft/year	**$500-1000**	
Location types & avg. size	**SC FR SP 30,000 sq.ft**	
First open in Canada	**1956**	
Merchandise price category	**Medium**	

(Source: Directory of Retail Chains in Canada 2002-2010, Monday Report on Retailers.
Note: 1. Ave.sale/Sq.Ft./Year indicates average sales per square foot per year for Canadian chains.
2. Location types & avg. size indicates the type of location the chain operates in, and the chain's average size; FR: freestanding/streetfront; SC: shopping centre; SP: strip plaza; PC: power center)

6. Safeway

Safeway Inc. is one of the largest food and drug retailers in North America. Canada Safeway store chains are located in British Columbia, Alberta, Saskatchewan, Manitoba and a few in Ontario. Safeway's store brands include:

(Source: Safeway 2009 Corporate Profile, http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9NTEzMDZ8Q2hpbGRJRD0tMXxUeXBlPTM=&t=1, accessed on June 1st, 2010)

Table A.6 Safeway's major store banners in Ontario and Alberta 2001-2009

Store banner	**Safeway**	
Year	ON	AB
2001	**6**	**79**
2002	**6**	**79**
2003	**6**	**79**
2004	**6**	**79**
2005	**6**	**79**
2006	**6**	**79**
2007	**6**	**79**
2008	**6**	**79**
2009	**6**	**95**
Ave sale/sq.ft/year	**$500-1000**	
Location types & avg. size	**SC FR SP 40,000 sq.ft**	
First open in Canada	**1929**	
Merchandise price category	**Medium**	

(Source: Directory of Retail Chains in Canada 2002-2010, Monday Report on Retailers.
Note: 1. Ave.sale/Sq.Ft./Year indicates average sales per square foot per year for Canadian chains.
2. Location types & avg. size indicates the type of location the chain operates in, and the chain's average size; FR: freestanding/streetfront; SC: shopping centre; SP: strip plaza; PC: power center)

7. Other store chains

Other store chain category includes: Wal-Mart, Costco, Longo's, M & M Meat Shops, etc.

Appendix (B):
Percentage of Zero Consumption in Each Model 2002-2007

Table B.1 Percentage of Ontario households with zero consumption in meat choice model 2002-2007

	YEAR						Total
Meat types	2002	2003	2004	2005	2006	2007	
Fresh pork	24%	22%	23%	23%	21%	19%	22%
Fresh beef	11%	9%	8%	9%	9%	8%	9%
Fresh poultry	7%	8%	8%	7%	8%	8%	7%
Fresh others	59%	44%	40%	40%	49%	48%	47%
Semi-processed pork	49%	44%	39%	36%	37%	33%	40%
Semi-processed beef	84%	82%	76%	72%	75%	67%	76%
Semi-processed poultry	74%	69%	61%	63%	62%	59%	65%
Semi-processed others	48%	47%	50%	56%	64%	65%	55%
Fully processed pork	52%	50%	41%	38%	35%	39%	43%
Fully processed beef	84%	85%	79%	81%	83%	84%	83%
Fully processed poultry	36%	38%	41%	41%	39%	47%	40%
Fully processed others	37%	34%	29%	23%	23%	24%	28%

Note: The source of these data is ACNielsen Homescan™ Panel, 2002-2007, Ontario household number is 1036 each year.

Table B.2 Percentage of Alberta households with zero consumption in meat choice model 2002-2007

	YEAR						Total
Meat types	2002	2003	2004	2005	2006	2007	
Fresh pork	20%	16%	20%	20%	19%	20%	19%
Fresh beef	11%	10%	11%	10%	13%	12%	11%
Fresh poultry	9%	7%	6%	7%	6%	8%	7%
Fresh others	57%	52%	46%	44%	49%	46%	49%
Semi-processed pork	70%	65%	57%	48%	54%	61%	59%
Semi-processed beef	70%	71%	71%	77%	77%	75%	73%
Semi-processed poultry	82%	81%	81%	78%	71%	67%	77%
Semi-processed others	53%	57%	57%	55%	61%	68%	59%
Fully processed pork	47%	37%	28%	27%	34%	36%	35%
Fully processed beef	80%	81%	81%	77%	73%	73%	77%
Fully processed poultry	43%	41%	42%	41%	46%	46%	43%
Fully processed others	37%	34%	28%	28%	26%	25%	30%

Note: The source of these data is ACNielsen Homescan™ Panel, 2002-2007, Alberta household number is 508 each year.

Table B.3 Percentage of Ontario households with zero consumption in store choice model 2002-2007

	YEAR						Total
Store chains	2002	2003	2004	2005	2006	2007	
Co-op	99%	99%	99%	99%	99%	99%	99%
Empire	49%	45%	44%	40%	41%	42%	44%
Loblaw	12%	12%	11%	13%	10%	11%	11%
Metro	30%	26%	27%	25%	25%	26%	27%
Safeway	99%	99%	99%	99%	99%	99%	99%
others	69%	66%	62%	56%	56%	52%	60%

Note: The source of these data is ACNielsen Homescan™ Panel, 2002-2007, Ontario household number is 1036 each year.

Table B.4 Percentage of Alberta households with zero consumption in store choice model 2002-2007

	YEAR						Total
Store chains	2002	2003	2004	2005	2006	2007	
Co-op	64%	64%	63%	58%	63%	63%	63%
Empire	48%	47%	46%	42%	45%	43%	45%
JPG	72%	73%	73%	73%	75%	73%	73%
Loblaw	47%	45%	43%	41%	41%	38%	43%
Safeway	29%	29%	27%	29%	31%	35%	30%
others	71%	67%	61%	61%	59%	57%	63%

Note: The source of these data is ACNielsen Homescan™ Panel, 2002-2007; Alberta household number is 508 each year.

Table B.5 Percentage of Ontario households with zero consumption in brand choice model 2002-2007

	YEAR						Total
Meat types	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	
National brand pork	89%	87%	59%	59%	49%	52%	66%
Private label pork	97%	96%	83%	79%	81%	82%	86%
National brand poultry	63%	70%	72%	69%	71%	74%	70%
Private label poultry	52%	50%	52%	57%	53%	61%	54%
National brand others	50%	47%	41%	34%	35%	37%	41%
Private label others	67%	65%	61%	59%	54%	58%	61%

Note: The source of these data is ACNielsen Homescan™ Panel, 2002-2007; Ontario household number is 1029 each year.

Table B.6 Percentage of Alberta households with zero consumption in brand choice model 2002-2007

	YEAR						Total
Meat types	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	
National brand pork	73%	71%	59%	58%	61%	60%	63%
Private label pork	96%	94%	81%	76%	82%	76%	84%
National brand poultry	73%	68%	68%	70%	69%	68%	69%
Private label poultry	58%	62%	62%	62%	69%	65%	63%
National brand others	45%	41%	37%	34%	32%	34%	37%
Private label others	78%	79%	68%	70%	71%	71%	73%

Note: The source of these data is ACNielsen Homescan™ Panel, 2002-2007, Alberta household number is 502 each year.

Appendix (C):
Descriptive Statistics for FAH Value Added Meat Expenditures 2002-2007

fresh pork * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh pork	0	251	224	241	239	221	201	1377
	0-20%	571	601	624	616	632	668	3712
	20-40%	178	181	150	165	166	150	990
	40-60%	31	24	18	12	16	12	113
	60-80%	5	5	3	4	0	5	22
	80%<	0	1	0	0	1	0	2
Total		1036	1036	1036	1036	1036	1036	6216

fresh beef * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh beef	0	119	92	87	96	92	88	574
	0-20%	266	309	306	337	322	329	1869
	20-40%	385	399	409	394	395	394	2376
	40-60%	201	186	186	170	186	184	1113
	60-80%	56	36	36	31	35	31	225
	80%<	9	14	12	8	6	10	59
Total		1036	1036	1036	1036	1036	1036	6216

fresh poultry * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh poultry	0	72	79	80	74	78	83	466
	0-20%	395	376	389	383	392	392	2327
	20-40%	373	410	416	420	411	388	2418
	40-60%	134	121	118	118	120	136	747
	60-80%	36	35	22	32	27	27	179
	80%<	26	15	11	9	8	10	79
Total		1036	1036	1036	1036	1036	1036	6216

fresh others * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh others	0	611	453	418	410	507	498	2897
	0-20%	391	492	531	548	472	480	2914
	20-40%	27	77	67	60	43	42	316
	40-60%	3	10	15	15	10	13	66
	60-80%	2	4	5	0	4	2	17
	80%<	2	0	0	3	0	1	6
Total		1036	1036	1036	1036	1036	1036	6216

semi pork * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi pork	0	504	455	406	376	382	344	2467
	0-20%	500	550	586	622	610	640	3508
	20-40%	28	25	37	36	40	45	211
	40-60%	4	4	5	2	4	6	25
	60-80%	0	2	1	0	0	1	4
	80%<	0	0	1	0	0	0	1
Total		1036	1036	1036	1036	1036	1036	6216

semi beef * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi beef	0	871	850	787	748	775	696	4727
	0-20%	163	184	248	285	258	336	1474
	20-40%	1	2	0	2	3	4	12
	40-60%	0	0	1	0	0	0	1
	60-80%	1	0	0	1	0	0	2
Total		1036	1036	1036	1036	1036	1036	6216

semi poultry * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi poultry	0	765	714	633	651	644	612	4019
	0-20%	255	304	370	353	365	389	2036
	20-40%	10	11	25	21	20	28	115

	40-60%	5	2	6	6	3	5	27
	60-80%	1	2	2	3	2	1	11
	80%<	0	3	0	2	2	1	8
Total		1036	1036	1036	1036	1036	1036	6216

semi others * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi others	0	496	490	518	580	658	671	3413
	0-20%	512	527	501	441	365	352	2698
	20-40%	27	17	16	14	8	9	91
	40-60%	1	2	1	1	2	4	11
	60-80%	0	0	0	0	1	0	1
	80%<	0	0	0	0	2	0	2
Total		1036	1036	1036	1036	1036	1036	6216

fully pork * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully pork	0	537	518	421	396	366	407	2645
	0-20%	480	501	586	593	615	588	3363
	20-40%	16	12	21	37	45	33	164
	40-60%	1	4	8	7	9	8	37
	60-80%	0	1	0	2	0	0	3
	80%<	2	0	0	1	1	0	4
Total		1036	1036	1036	1036	1036	1036	6216

fully beef * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully beef	0	871	884	822	843	863	871	5154
	0-20%	162	147	213	192	169	163	1046
	20-40%	3	4	1	1	2	1	12
	40-60%	0	1	0	0	2	1	4
Total		1036	1036	1036	1036	1036	1036	6216

fully poultry * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully poultry	0	372	397	420	424	406	485	2504
	0-20%	495	498	482	509	518	458	2960
	20-40%	113	95	102	81	88	69	548
	40-60%	31	36	29	15	19	18	148
	60-80%	20	7	1	5	3	5	41
	80%<	5	3	2	2	2	1	15
Total		1036	1036	1036	1036	1036	1036	6216

fully others * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully others	0	388	348	301	243	237	253	1770
	0-20%	505	555	593	630	611	612	3506
	20-40%	98	98	108	120	133	132	689
	40-60%	34	27	24	30	36	20	171
	60-80%	4	5	5	8	16	11	49
	80%<	7	3	5	5	3	8	31
Total		1036	1036	1036	1036	1036	1036	6216

fresh meat * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh meat	0	19	11	11	10	15	11	77
	0-20%	34	24	30	24	28	27	167
	20-40%	68	77	75	94	98	86	498
	40-60%	171	155	190	200	219	206	1141
	60-80%	358	392	407	407	379	412	2355
	80%<	386	377	323	301	297	294	1978
Total		1036	1036	1036	1036	1036	1036	6216

semi meat * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi meat	0	239	201	171	155	179	154	1099
	0-20%	667	703	694	720	703	696	4183

	20-40%	113	110	140	138	125	146	772
	40-60%	12	14	25	14	21	34	120
	60-80%	5	4	5	7	4	5	30
	80%<	0	4	1	2	4	1	12
Total		1036	1036	1036	1036	1036	1036	6216

fully meat * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully meat	0	109	95	76	71	60	71	482
	0-20%	508	534	522	511	493	523	3091
	20-40%	246	256	292	295	298	290	1677
	40-60%	97	94	95	105	123	95	609
	60-80%	43	39	31	38	41	40	232
	80%<	33	18	20	16	21	17	125
Total		1036	1036	1036	1036	1036	1036	6216

pork * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
pork	0	154	143	140	118	112	95	762
	0-20%	445	460	435	413	425	422	2600
	20-40%	350	346	371	410	398	419	2294
	40-60%	73	67	75	76	86	80	457
	60-80%	9	18	12	18	10	16	83
	80%<	5	2	3	1	5	4	20
Total		1036	1036	1036	1036	1036	1036	6216

beef * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
beef	0	113	86	82	90	86	84	541
	0-20%	256	293	285	312	297	284	1727
	20-40%	379	392	398	392	401	396	2358
	40-60%	212	208	218	194	202	222	1256
	60-80%	65	42	38	38	43	39	265
	80%<	11	15	15	10	7	11	69
Total		1036	1036	1036	1036	1036	1036	6216

poultry * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
poultry	0	33	35	41	36	34	40	219
	0-20%	199	204	199	212	216	214	1244
	20-40%	395	425	441	457	460	438	2616
	40-60%	267	246	245	215	235	246	1454
	60-80%	91	89	84	86	68	78	496
	80%<	51	37	26	30	23	20	187
Total		1036	1036	1036	1036	1036	1036	6216

others * Meat Expenditure Share Summary, proportion of households in Ontario 2002-2007

Count

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
others	0	165	114	99	90	116	116	700
	0-20%	591	580	598	586	573	588	3516
	20-40%	198	242	232	251	235	236	1394
	40-60%	57	71	76	74	66	61	405
	60-80%	13	22	18	21	34	24	132
	80%<	12	7	13	14	12	11	69
Total		1036	1036	1036	1036	1036	1036	6216

fresh pork * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

	YEAR						Total
	2002	2003	2004	2005	2006	2007	
0	251	224	241	239	221	201	1377
1. [0-25]	277	273	272	266	299	310	1697
2. [25-50]	182	191	203	164	178	174	1092
3. [50-100]	188	201	179	217	187	201	1173
fresh pork 4. [100-300]	132	133	138	138	145	146	832
5. [300-500]	5	12	3	12	5	4	41
6. [500+]	1	2	0	0	1	0	4
Total	1036	1036	1036	1036	1036	1036	6216

fresh beef * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

	YEAR						Total
	2002	2003	2004	2005	2006	2007	

fresh beef	0	119	92	87	96	92	88	574
	1. [0-25]	196	182	177	185	193	184	1117
	2. [25-50]	136	157	148	148	155	154	898
	3. [50-100]	189	210	202	209	197	198	1205
	4. [100-300]	322	307	320	298	303	327	1877
	5. [300-500]	57	67	78	75	72	62	411
	6. [500+]	17	21	24	25	24	23	134
Total		1036	1036	1036	1036	1036	1036	6216

fresh poultry * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh poultry	0	72	79	80	74	78	83	466
	1. [0-25]	216	199	169	179	177	164	1104
	2. [25-50]	183	162	163	149	164	187	1008
	3. [50-100]	255	258	259	260	261	226	1519
	4. [100-300]	280	294	313	326	304	320	1837
	5. [300-500]	25	40	42	38	42	49	236
	6. [500+]	5	4	10	10	10	7	46
Total		1036	1036	1036	1036	1036	1036	6216

fresh others * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh others	0	611	453	418	410	507	498	2897
	1. [0-25]	298	353	343	349	318	321	1982
	2. [25-50]	72	120	138	139	98	107	674
	3. [50-100]	38	80	85	91	78	69	441
	4. [100-300]	17	29	51	44	30	36	207
	5. [300-500]	0	1	1	1	3	3	9
	6. [500+]	0	0	0	2	2	2	6
Total		1036	1036	1036	1036	1036	1036	6216

semi pork * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi pork	0	504	455	406	376	382	344	2467
	1. [0-25]	343	364	366	350	375	366	2164
	2. [25-50]	107	124	131	158	145	193	858
	3. [50-100]	59	58	80	100	100	99	496
	4. [100-300]	22	35	51	50	34	34	226
	5. [300-500]	1	0	2	2	0	0	5
Total		1036	1036	1036	1036	1036	1036	6216

semi beef * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi beef	0	871	850	787	748	775	696	4727
	1. [0-25]	146	159	217	236	207	281	1246
	2. [25-50]	15	21	27	42	37	37	179
	3. [50-100]	4	6	5	8	14	17	54
	4. [100-300]	0	0	0	2	3	5	10
Total		1036	1036	1036	1036	1036	1036	6216

semi poultry * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi poultry	0	765	714	633	651	644	612	4019
	1. [0-25]	205	235	287	273	282	295	1577
	2. [25-50]	49	55	74	79	76	82	415
	3. [50-100]	16	23	32	28	28	41	168
	4. [100-300]	1	9	10	5	6	6	37
Total		1036	1036	1036	1036	1036	1036	6216

semi others * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi others	0	496	490	518	580	658	671	3413
	1. [0-25]	411	430	423	382	303	288	2237
	2. [25-50]	90	85	66	52	53	49	395
	3. [50-100]	38	25	25	19	19	26	152
	4. [100-300]	1	6	4	3	3	2	19
Total		1036	1036	1036	1036	1036	1036	6216

fully pork * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully pork	0	537	518	421	396	366	407	2645
	1. [0-25]	382	399	388	406	415	402	2392
	2. [25-50]	88	90	155	146	163	150	792
	3. [50-100]	26	22	60	74	80	63	325
	4. [100-300]	3	7	12	14	11	14	61
	5. [300-500]	0	0	0	0	1	0	1
Total		1036	1036	1036	1036	1036	1036	6216

fully beef * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully beef	0	871	884	822	843	863	871	5154
	1. [0-25]	137	129	191	165	154	147	923
	2. [25-50]	21	15	15	22	12	14	99
	3. [50-100]	6	7	7	6	7	4	37
	4. [100-300]	1	1	1	0	0	0	3
Total		1036	1036	1036	1036	1036	1036	6216

fully poultry * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully poultry	0	372	397	420	424	406	485	2504
	1. [0-25]	317	329	291	317	353	301	1908
	2. [25-50]	164	120	128	137	126	110	785
	3. [50-100]	111	102	106	90	92	83	584
	4. [100-300]	69	84	88	64	57	53	415
	5. [300-500]	3	4	3	4	2	3	19
	6. [500+]	0	0	0	0	0	1	1
Total		1036	1036	1036	1036	1036	1036	6216

fully others * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully others	0	388	348	301	243	237	253	1770
	1. [0-25]	361	365	364	361	344	360	2155
	2. [25-50]	159	169	177	205	198	187	1095
	3. [50-100]	83	97	134	153	174	152	793
	4. [100-300]	43	56	55	71	80	79	384
	5. [300-500]	2	0	4	3	2	3	14
	6. [500+]	0	1	1	0	1	2	5
Total		1036	1036	1036	1036	1036	1036	6216

pork * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
pork	0	154	143	140	118	112	95	762
	1.[0-50]	390	394	355	340	354	356	2189
	2.[50-100]	235	217	222	239	238	249	1400
	3.[100-300]	237	252	289	295	300	310	1683
	4.[300-500]	19	27	28	37	29	23	163
	5.[500-1000]	1	3	2	7	3	3	19

Total	1036	1036	1036	1036	1036	1036	6216

beef * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
beef	0	113	86	82	90	86	84	541
	1.[0-50]	331	337	309	324	334	318	1953
	2.[50-100]	189	209	201	193	197	196	1185
	3.[100-300]	322	312	335	321	318	343	1951
	4.[300-500]	62	69	82	78	72	67	430
	5.[500-1000]	17	22	26	27	27	27	146
	6.[1000+]	2	1	1	3	2	1	10
Total		1036	1036	1036	1036	1036	1036	6216

poultry * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
poultry	0	33	35	41	36	34	40	219
	1.[0-50]	303	279	241	260	268	278	1629
	2.[50-100]	240	244	240	225	227	215	1391
	3.[100-300]	399	390	411	420	422	408	2450
	4.[300-500]	50	71	78	72	65	72	408
	5.[500-1000]	11	17	25	23	19	22	117
	6.[1000+]	0	0	0	0	1	1	2
Total		1036	1036	1036	1036	1036	1036	6216

others * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
others	0	165	114	99	90	116	116	700
	1.[0-50]	571	563	514	507	483	516	3154
	2.[50-100]	193	203	230	226	245	227	1324
	3.[100-300]	99	146	176	197	176	159	953
	4.[300-500]	8	8	15	13	11	12	67
	5.[500-1000]	0	2	2	3	5	6	18

Total	1036	1036	1036	1036	1036	1036	6216

fresh meat * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh meat	0	19	11	11	10	15	11	77
	1.[0-50]	165	142	127	118	138	121	811
	2.[50-100]	148	139	125	140	130	148	830
	3.[100-300]	388	388	390	403	404	392	2365
	4.[300-500]	195	207	213	196	183	204	1198
	5.[500-1000]	109	131	144	142	142	131	799
	6.[1000+]	12	18	26	27	24	29	136
Total		1036	1036	1036	1036	1036	1036	6216

semi meat * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi meat	0	239	201	171	155	179	154	1099
	1.[0-50]	575	590	567	562	562	530	3386
	2.[50-100]	156	164	190	201	188	231	1130
	3.[100-300]	64	81	104	114	106	120	589
	4.[300-500]	2	0	3	4	1	1	11
	5.[500-1000]	0	0	1	0	0	0	1
Total		1036	1036	1036	1036	1036	1036	6216

fully meat * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully meat	0	109	95	76	71	60	71	482
	1.[0-50]	496	507	459	433	410	448	2753
	2.[50-100]	224	199	229	267	290	262	1471
	3.[100-300]	192	218	243	232	250	228	1363
	4.[300-500]	13	13	22	28	20	23	119

	5.[500-1000]	2	4	7	5	6	3	27
	6.[1000+]	0	0	0	0	0	1	1
Total		1036	1036	1036	1036	1036	1036	6216

Total meat * Meat Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Total meat	1.[0-100]	209	171	151	127	147	142	947
	2.[100-500]	599	601	579	604	590	597	3570
	3.[500-1000]	198	220	251	236	242	243	1390
	4.[1000-1500]	23	38	43	58	44	40	246
	5.[1500-2000]	5	3	11	8	10	11	48
	6.[2000+]	2	3	1	3	3	3	15
Total		1036	1036	1036	1036	1036	1036	6216

fresh pork * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh pork	0	101	80	103	104	94	104	586
	1. [0-25]	108	94	99	87	115	115	618
	2. [25-50]	85	78	77	78	103	98	519
	3. [50-100]	97	137	110	99	99	93	635
	4. [100-300]	109	108	106	131	90	95	639
	5. [300-500]	7	8	10	5	6	1	37
	6. [500+]	1	3	3	4	1	2	14
Total		508	508	508	508	508	508	3048

fresh beef * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh beef	0	55	53	54	50	64	63	339
	1. [0-25]	63	46	73	84	64	76	406
	2. [25-50]	54	53	62	67	70	69	375

	3. [50-100]	94	103	93	78	83	81	532
	4. [100-300]	180	179	166	171	160	157	1013
	5. [300-500]	45	51	45	38	52	41	272
	6. [500+]	17	23	15	20	15	21	111
	Total	508	508	508	508	508	508	3048

fresh poultry * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh poultry	0	46	37	32	35	33	40	223
	1. [0-25]	80	63	79	79	75	68	444
	2. [25-50]	78	94	71	69	63	77	452
	3. [50-100]	129	132	135	127	145	134	802
	4. [100-300]	157	166	171	168	168	166	996
	5. [300-500]	16	14	13	26	18	20	107
	6. [500+]	2	2	7	4	6	3	24
	Total	508	508	508	508	508	508	3048

fresh others * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh others	0	289	263	235	225	250	235	1497
	1. [0-25]	139	127	150	157	166	168	907
	2. [25-50]	50	67	69	73	59	65	383
	3. [50-100]	20	39	33	36	21	31	180
	4. [100-300]	9	12	19	17	12	9	78
	5. [300-500]	1	0	2	0	0	0	3
	Total	508	508	508	508	508	508	3048

semi pork * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi pork	0	358	330	292	245	273	309	1807

1. [0-25]	126	144	138	176	192	159	935
2. [25-50]	14	23	55	57	28	29	206
3. [50-100]	9	9	16	21	12	6	73
4. [100-300]	1	2	7	7	3	5	25
5. [300-500]	0	0	0	1	0	0	1
6. [500+]	0	0	0	1	0	0	1
Total	508	508	508	508	508	508	3048

semi beef * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi beef	0	358	363	360	391	389	379	2240
	1. [0-25]	133	124	122	86	102	111	678
	2. [25-50]	12	15	21	26	13	14	101
	3. [50-100]	5	6	5	3	3	3	25
	4. [100-300]	0	0	0	2	1	1	4
Total		508	508	508	508	508	508	3048

semi poultry * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi poultry	0	416	411	414	394	360	340	2335
	1. [0-25]	78	82	74	88	108	124	554
	2. [25-50]	11	14	17	23	29	33	127
	3. [50-100]	3	1	3	3	11	9	30
	4. [100-300]	0	0	0	0	0	2	2
Total		508	508	508	508	508	508	3048

semi others * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi others	0	270	289	291	279	312	346	1787
	1. [0-25]	195	191	178	199	168	137	1068
	2. [25-50]	35	22	29	22	20	21	149

3. [50-100]	8	6	9	6	7	3	39
4. [100-300]	0	0	1	2	1	1	5
Total	508	508	508	508	508	508	3048

fully pork * Meat Expenditure (CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully pork	0	237	186	143	136	175	181	1058
	1. [0-25]	172	191	191	183	172	185	1094
	2. [25-50]	64	84	100	118	93	77	536
	3. [50-100]	33	44	62	60	55	49	303
	4. [100-300]	2	3	12	11	13	16	57
Total		508	508	508	508	508	508	3048

fully beef * Meat Expenditure (CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully beef	0	405	410	414	389	369	373	2360
	1. [0-25]	92	88	83	108	115	122	608
	2. [25-50]	8	7	10	4	20	8	57
	3. [50-100]	2	3	1	6	3	4	19
	4. [100-300]	1	0	0	1	1	1	4
Total		508	508	508	508	508	508	3048

fully poultry * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully poultry	0	219	206	213	207	236	233	1314
	1. [0-25]	136	161	155	164	142	134	892
	2. [25-50]	70	71	64	57	54	64	380
	3. [50-100]	52	37	48	51	51	47	286
	4. [100-300]	31	33	26	27	24	29	170
	5. [300-500]	0	0	2	2	1	1	6

Total	508	508	508	508	508	508	3048

fully others * Meat Expenditure (CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully others	0	189	173	142	143	132	127	906
	1. [0-25]	192	171	158	157	177	186	1041
	2. [25-50]	69	99	88	99	105	91	551
	3. [50-100]	48	53	77	80	63	71	392
	4. [100-300]	10	12	43	28	30	32	155
	5. [300-500]	0	0	0	1	1	1	3
Total		508	508	508	508	508	508	3048

pork * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
pork	0	69	40	49	43	48	59	308
	1.[0-50]	169	162	146	147	178	179	981
	2.[50-100]	119	125	122	106	120	110	702
	3.[100-300]	137	163	160	187	142	142	931
	4.[300-500]	12	13	24	19	14	16	98
	5.[500-1000]	2	5	7	6	6	2	28
Total		508	508	508	508	508	508	3048

beef * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
beef	0	51	48	49	45	56	57	306
	1.[0-50]	113	101	135	149	130	143	771
	2.[50-100]	95	96	79	72	82	80	504
	3.[100-300]	186	185	176	179	168	160	1054
	4.[300-500]	45	53	51	40	52	46	287
	5.[500-1000]	17	24	18	23	20	22	124
	6.[1000+]	1	1	0	0	0	0	2
Total		508	508	508	508	508	508	3048

poultry * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
poultry	0	24	20	17	15	18	18	112
	1.[0-50]	129	110	121	111	109	118	698
	2.[50-100]	120	141	122	133	123	120	759
	3.[100-300]	206	205	206	208	221	212	1258
	4.[300-500]	23	29	32	33	30	31	178
	5.[500-1000]	6	2	9	8	7	9	41
	6.[1000+]	0	1	1	0	0	0	2
	Total	508	508	508	508	508	508	3048

others * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
others	0	82	66	56	53	68	59	384
	1.[0-50]	295	279	250	250	254	271	1599
	2.[50-100]	86	107	102	117	112	98	622
	3.[100-300]	43	52	93	83	73	78	422
	4.[300-500]	2	3	6	4	1	2	18
	5.[500-1000]	0	1	1	1	0	0	3
	Total	508	508	508	508	508	508	3048

fresh meat * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh meat	0	14	8	9	11	8	9	59
	1.[0-50]	52	41	51	46	47	52	289
	2.[50-100]	45	50	57	51	67	61	331
	3.[100-300]	194	180	188	187	194	193	1136
	4.[300-500]	100	116	89	111	85	92	593
	5.[500-1000]	91	95	102	86	90	87	551
	6.[1000+]	12	18	12	16	17	14	89
	Total	508	508	508	508	508	508	3048

semi meat * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi meat	0	151	152	131	119	129	153	835
	1.[0-50]	311	305	296	301	310	296	1819
	2.[50-100]	40	40	61	59	50	44	294
	3.[100-300]	6	11	19	26	19	14	95
	4.[300-500]	0	0	1	2	0	1	4
	5.[500-1000]	0	0	0	1	0	0	1
Total		508	508	508	508	508	508	3048

fully meat * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully meat	0	49	33	35	25	30	31	203
	1.[0-50]	242	226	175	185	198	203	1229
	2.[50-100]	119	142	151	141	140	121	814
	3.[100-300]	95	103	141	149	131	145	764
	4.[300-500]	3	4	6	8	9	8	38
Total		508	508	508	508	508	508	3048

Total meat * Meat Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Total meat	1.[0-100]	83	57	61	55	61	67	384
	2.[100-500]	284	285	277	290	293	295	1724
	3.[500-1000]	119	141	138	124	127	117	766
	4.[1000-1500]	17	18	25	32	20	23	135
	5.[1500-2000]	4	3	4	3	5	4	23
	6.[2000+]	1	4	3	4	2	2	16
Total		508	508	508	508	508	508	3048

fresh pork * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh pork	0	101	80	103	104	94	104	586
	0-20%	263	265	260	244	295	286	1613
	20-40%	124	138	127	143	104	103	739
	40-60%	16	22	13	13	15	14	93
	60-80%	2	3	5	3	0	0	13
	80%<	2	0	0	1	0	1	4
Total		508	508	508	508	508	508	3048

fresh beef * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh beef	0	55	53	54	50	64	63	339
	0-20%	91	88	137	142	118	115	691
	20-40%	181	198	192	202	189	200	1162
	40-60%	145	132	105	99	112	112	705
	60-80%	32	31	18	12	21	16	130
	80%<	4	6	2	3	4	2	21
Total		508	508	508	508	508	508	3048

fresh poultry * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh poultry	0	46	37	32	35	33	40	223
	0-20%	179	196	196	177	173	158	1079
	20-40%	198	200	200	222	220	223	1263
	40-60%	61	60	57	55	59	64	356
	60-80%	18	9	17	12	16	15	87
	80%<	6	6	6	7	7	8	40
Total		508	508	508	508	508	508	3048

fresh others * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh others	0	289	263	235	225	250	235	1497
	0-20%	199	223	244	257	238	254	1415

	20-40%	17	16	24	22	16	14	109
	40-60%	2	6	2	3	2	3	18
	60-80%	0	0	1	1	1	2	5
	80%<	1	0	2	0	1	0	4
Total		508	508	508	508	508	508	3048

semi pork * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
	0	358	330	292	245	273	309	1807
	0-20%	146	171	204	249	228	195	1193
semi pork	20-40%	4	5	10	10	7	4	40
	40-60%	0	1	2	4	0	0	7
	60-80%	0	1	0	0	0	0	1
Total		508	508	508	508	508	508	3048

semi beef * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
	0	358	363	360	391	389	379	2240
semi beef	0-20%	149	145	144	116	118	128	800
	20-40%	1	0	4	1	1	1	8
Total		508	508	508	508	508	508	3048

semi poultry * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
	0	416	411	414	394	360	340	2335
	0-20%	90	96	92	112	142	157	689
semi	20-40%	2	0	2	2	4	8	18
poultry	40-60%	0	0	0	0	1	3	4
	60-80%	0	0	0	0	1	0	1
	80%<	0	1	0	0	0	0	1
Total		508	508	508	508	508	508	3048

semi others * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

	YEAR						Total
	2002	2003	2004	2005	2006	2007	

semi others	0	270	289	291	279	312	346	1787
	0-20%	229	216	212	224	193	156	1230
	20-40%	7	3	3	5	3	3	24
	40-60%	1	0	2	0	0	1	4
	60-80%	0	0	0	0	0	2	2
	80%<	1	0	0	0	0	0	1
Total		508	508	508	508	508	508	3048

fully pork * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully pork	0	237	186	143	136	175	181	1058
	0-20%	251	309	330	337	302	300	1829
	20-40%	14	7	21	29	25	21	117
	40-60%	3	4	9	3	5	6	30
	60-80%	1	1	3	2	1	0	8
	80%<	2	1	2	1	0	0	6
Total		508	508	508	508	508	508	3048

fully beef * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully beef	0	405	410	414	389	369	373	2360
	0-20%	101	97	94	119	137	135	683
	20-40%	2	1	0	0	1	0	4
	60-80%	0	0	0	0	1	0	1
Total		508	508	508	508	508	508	3048

fully poultry * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully poultry	0	219	206	213	207	236	233	1314
	0-20%	227	251	247	257	229	221	1432
	20-40%	43	34	36	29	30	37	209
	40-60%	9	11	9	13	11	10	63
	60-80%	5	3	3	1	2	5	19
	80%<	5	3	0	1	0	2	11
Total		508	508	508	508	508	508	3048

fully others * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully others	0	189	173	142	143	132	127	906
	0-20%	277	287	297	290	307	302	1760
	20-40%	31	34	50	51	35	52	253
	40-60%	5	6	12	14	24	16	77
	60-80%	3	3	5	5	6	4	26
	80%<	3	5	2	5	4	7	26
Total		508	508	508	508	508	508	3048

fresh meat * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fresh meat	0	14	8	9	11	8	9	59
	0-20%	5	9	16	11	12	14	67
	20-40%	21	21	20	27	34	35	158
	40-60%	56	49	81	76	72	70	404
	60-80%	148	154	184	198	183	173	1040
	80%<	264	267	198	185	199	207	1320
Total		508	508	508	508	508	508	3048

semi meat * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
semi meat	0	151	152	131	119	129	153	835
	0-20%	333	341	345	351	350	316	2036
	20-40%	21	11	28	33	25	32	150
	40-60%	2	2	4	4	3	4	19
	60-80%	0	1	0	1	1	3	6
	80%<	1	1	0	0	0	0	2
Total		508	508	508	508	508	508	3048

fully meat * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
fully meat	0	49	33	35	25	30	31	203
	0-20%	279	299	248	240	260	253	1579

	20-40%	113	114	141	167	135	136	806
	40-60%	36	34	52	46	43	47	258
	60-80%	16	15	15	14	25	24	109
	80%<	15	13	17	16	15	17	93
Total		508	508	508	508	508	508	3048

pork * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
pork	0	69	40	49	43	48	59	308
	0-20%	207	204	184	159	216	218	1188
	20-40%	189	210	193	220	187	182	1181
	40-60%	29	42	64	69	49	45	298
	60-80%	9	9	14	15	7	3	57
	80%<	5	3	4	2	1	1	16
Total		508	508	508	508	508	508	3048

beef * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
beef	0	51	48	49	45	56	57	306
	0-20%	87	83	123	134	110	114	651
	20-40%	171	191	191	202	183	185	1123
	40-60%	158	143	121	107	128	132	789
	60-80%	35	36	22	17	26	18	154
	80%<	6	7	2	3	5	2	25
Total		508	508	508	508	508	508	3048

poultry * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
poultry	0	24	20	17	15	18	18	112
	0-20%	105	126	119	122	106	99	677
	20-40%	214	224	234	235	225	220	1352
	40-60%	105	96	89	98	107	111	606
	60-80%	41	25	37	26	39	44	212
	80%<	19	17	12	12	13	16	89
Total		508	508	508	508	508	508	3048

others * Meat Expenditure Share Summary, proportion of households in Alberta 2002-2007

	YEAR						Total
	2002	2003	2004	2005	2006	2007	

others	0	82	66	56	53	68	59	384
	0-20%	321	335	298	307	305	313	1879
	20-40%	73	80	111	105	82	90	541
	40-60%	22	15	31	25	37	27	157
	60-80%	1	5	7	10	9	8	40
	80%<	9	7	5	8	7	11	47
Total		508	508	508	508	508	508	3048

Appendix (D):
Descriptive Statistics for FAH Store Expenditures 2002-2007

Coop * Store Expenditure(CAN$)Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Coop	0	1031	1033	1032	1034	1034	1035	6199
	1.[0-50]	4	3	4	2	2	1	16
	3.[100-300]	1	0	0	0	0	0	1
Total		1036	1036	1036	1036	1036	1036	6216

Empire * Store Expenditure(CAN$)Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Empire	0	507	467	459	417	427	433	2710
	1.[0-50]	284	289	263	276	285	285	1682
	2.[50-100]	95	98	99	111	115	121	639
	3.[100-300]	107	124	145	154	148	138	816
	4.[300-500]	23	34	47	53	33	29	219
	5.[500-1000]	17	21	20	20	25	24	127
	6.[1000+]	3	3	3	5	3	6	23
Total		1036	1036	1036	1036	1036	1036	6216

Loblaw * Store Expenditure(CAN$)Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Loblaw	0	128	120	110	130	102	116	706
	1.[0-50]	251	262	246	226	265	206	1456
	2.[50-100]	158	154	155	162	149	163	941
	3.[100-300]	301	308	317	302	308	320	1856
	4.[300-500]	102	102	104	105	117	130	660
	5.[500-1000]	84	76	86	90	71	86	493
	6.[1000+]	12	14	18	21	24	15	104
Total		1036	1036	1036	1036	1036	1036	6216

METRO * Store Expenditure(CAN$)Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
METRO	0	310	267	284	263	258	271	1653
	1.[0-50]	300	295	257	276	297	291	1716
	2.[50-100]	128	132	141	159	134	153	847
	3.[100-300]	212	219	239	231	242	224	1367
	4.[300-500]	59	83	63	68	64	63	400
	5.[500-1000]	23	35	43	33	36	27	197
	6.[1000+]	4	5	9	6	5	7	36
Total		1036	1036	1036	1036	1036	1036	6216

Safeway * Store Expenditure(CAN$)Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Safeway	0	1030	1026	1025	1027	1024	1025	6157
	1.[0-50]	3	2	4	2	4	2	17
	2.[50-100]	1	5	1	1	3	5	16
	3.[100-300]	2	1	2	5	5	2	17
	4.[300-500]	0	1	2	1	0	2	6
	5.[500-1000]	0	1	2	0	0	0	3
Total		1036	1036	1036	1036	1036	1036	6216

Others * Store Expenditure(CAN$)Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
others	0	719	684	639	576	576	539	3733
	1.[0-50]	246	263	275	337	324	361	1806
	2.[50-100]	45	60	71	63	71	81	391
	3.[100-300]	26	28	46	55	55	49	259
	4.[300-500]	0	1	3	3	9	4	20
	5.[500-1000]	0	0	2	2	1	2	7
Total		1036	1036	1036	1036	1036	1036	6216

Co-op * Store Expenditure Share Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
coop_sh	0	1031	1033	1032	1034	1034	1035	6199
	0-20%	3	2	4	2	2	0	13
	20-40%	0	0	0	0	0	1	1
	40-60%	1	0	0	0	0	0	1
	60-80%	1	0	0	0	0	0	1
	80%<	0	1	0	0	0	0	1
Total		1036	1036	1036	1036	1036	1036	6216

Empire* Store Expenditure Share Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
emp_sh	0	507	467	459	417	427	433	2710
	0-20%	278	286	265	277	296	312	1714
	20-40%	100	99	124	131	123	124	701
	40-60%	59	70	86	92	82	69	458
	60-80%	40	64	51	66	60	56	337
	80%<	52	50	51	53	48	42	296
Total		1036	1036	1036	1036	1036	1036	6216

Loblaw * Store Expenditure Share Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
lob_sh	0	128	120	110	130	102	116	706
	0-20%	177	223	228	206	234	189	1257
	20-40%	159	166	170	195	191	179	1060
	40-60%	142	151	159	162	141	164	919
	60-80%	128	136	142	129	141	156	832
	80%<	302	240	227	214	227	232	1442
Total		1036	1036	1036	1036	1036	1036	6216

Metro * Store Expenditure Share Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
metro_sh	0	310	267	284	263	258	271	1653
	0-20%	251	239	241	277	267	273	1548
	20-40%	141	170	169	161	174	197	1012
	40-60%	110	122	120	138	139	110	739
	60-80%	101	118	109	99	98	89	614
	80%<	123	120	113	98	100	96	650

Total	1036	1036	1036	1036	1036	1036	6216

Safeway * Store Expenditure Share Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
safe_sh	0	1030	1026	1025	1027	1024	1025	6157
	0-20%	3	2	2	1	4	2	14
	20-40%	1	4	2	3	2	0	12
	40-60%	1	1	3	3	3	4	15
	60-80%	0	2	3	1	2	1	9
	80%<	1	1	1	1	1	4	9
Total		1036	1036	1036	1036	1036	1036	6216

Others * Store Expenditure Share Summary, proportion of households in Ontario 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
oth_sh	0	719	684	639	576	576	539	3733
	0-20%	224	254	278	333	325	363	1777
	20-40%	40	58	69	68	72	76	383
	40-60%	23	23	20	25	34	25	150
	60-80%	12	7	14	18	17	13	81
	80%<	18	10	16	16	12	20	92
Total		1036	1036	1036	1036	1036	1036	6216

Coop * Store Expenditure(CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Coop	0	324	325	321	296	320	321	1907
	1.[0-50]	48	52	66	83	52	56	357
	2.[50-100]	31	29	30	36	38	28	192
	3.[100-300]	70	62	49	58	58	62	359
	4.[300-500]	22	26	27	21	21	22	139
	5.[500-1000]	11	13	15	12	18	18	87
	6.[1000+]	2	1	0	2	1	1	7
Total		508	508	508	508	508	508	3048

Empire * Store Expenditure(CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Empire	0	244	239	234	214	230	220	1381
	1.[0-50]	124	124	125	131	119	146	769
	2.[50-100]	47	46	56	60	50	42	301
	3.[100-300]	60	67	61	68	73	69	398
	4.[300-500]	20	20	20	18	18	17	113
	5.[500-1000]	12	11	11	15	17	14	80
	6.[1000+]	1	1	1	2	1	0	6
	Total	508	508	508	508	508	508	3048

JPG * Store Expenditure(CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
JPG	0	364	371	371	371	382	372	2231
	1.[0-50]	78	70	78	79	62	64	431
	2.[50-100]	24	23	18	23	24	30	142
	3.[100-300]	30	34	30	28	32	31	185
	4.[300-500]	8	4	9	6	6	8	41
	5.[500-1000]	3	5	2	1	2	3	16
	6.[1000+]	1	1	0	0	0	0	2
	Total	508	508	508	508	508	508	3048

Loblaw * Store Expenditure(CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Loblaw	0	237	230	220	208	208	195	1298
	1.[0-50]	128	114	133	124	120	122	741
	2.[50-100]	50	62	54	63	56	62	347
	3.[100-300]	68	67	71	74	82	81	443
	4.[300-500]	18	24	14	25	25	28	134
	5.[500-1000]	6	10	15	10	15	17	73
	6.[1000+]	1	1	1	4	2	3	12
	Total	508	508	508	508	508	508	3048

Safeway * Store Expenditure(CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
Safeway	0	145	149	135	146	159	180	914
	1.[0-50]	114	84	101	94	122	110	625
	2.[50-100]	52	68	57	58	48	58	341
	3.[100-300]	110	98	108	106	108	95	625
	4.[300-500]	50	58	49	52	32	32	273
	5.[500-1000]	29	40	48	46	32	26	221
	6.[1000+]	8	11	10	6	7	7	49
Total		508	508	508	508	508	508	3048

others * Store Expenditure(CAN$)Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
others	0	361	338	310	309	299	288	1905
	1.[0-50]	101	123	137	139	146	141	787
	2.[50-100]	32	26	31	32	34	34	189
	3.[100-300]	13	18	28	25	27	43	154
	4.[300-500]	1	3	1	2	2	1	10
	5.[500-1000]	0	0	1	1	0	1	3
Total		508	508	508	508	508	508	3048

Co-op * Store Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
coop_sh	0	324	325	321	296	320	321	1907
	0-20%	50	58	66	92	60	63	389
	20-40%	41	39	35	35	42	34	226
	40-60%	22	20	24	28	17	27	138
	60-80%	23	21	24	19	27	19	133
	80%<	48	45	38	38	42	44	255
Total		508	508	508	508	508	508	3048

Empire * Store Expenditure Share Summary, proportion of households in Alberta 2002-2007

	YEAR	Total

		2002	2003	2004	2005	2006	2007	
emp_sh	0	244	239	234	214	230	220	1381
	0-20%	132	144	145	158	134	161	874
	20-40%	46	41	47	55	65	50	304
	40-60%	31	32	33	31	33	26	186
	60-80%	23	22	21	28	21	23	138
	80%<	32	30	28	22	25	28	165
Total		508	508	508	508	508	508	3048

JPG * Store Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
JPG_sh	0	364	371	371	371	382	372	2231
	0-20%	81	78	78	79	61	78	455
	20-40%	22	20	23	27	24	21	137
	40-60%	13	18	16	15	13	15	90
	60-80%	10	7	6	4	15	6	48
	80%<	18	14	14	12	13	16	87
Total		508	508	508	508	508	508	3048

Loblaw* Store Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
lob_sh	0	237	230	220	208	208	195	1298
	0-20%	138	136	138	144	125	132	813
	20-40%	53	56	64	64	64	56	357
	40-60%	23	26	33	34	44	44	204
	60-80%	24	21	21	24	31	37	158
	80%<	33	39	32	34	36	44	218
Total		508	508	508	508	508	508	3048

Safeway * Store Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
safe_sh	0	145	149	135	146	159	180	914
	0-20%	101	92	90	93	109	117	602
	20-40%	59	52	68	69	69	57	374
	40-60%	62	57	59	48	46	34	306
	60-80%	47	59	51	65	50	47	319
	80%<	94	99	105	87	75	73	533
Total		508	508	508	508	508	508	3048

Others * Store Expenditure Share Summary, proportion of households in Alberta 2002-2007

		YEAR						Total
		2002	2003	2004	2005	2006	2007	
oth_sh	0	361	338	310	309	299	288	1905
	0-20%	103	131	154	143	152	152	835
	20-40%	21	20	24	34	29	38	166
	40-60%	10	9	9	12	13	15	68
	60-80%	8	5	5	7	9	9	43
	80%<	5	5	6	3	6	6	31
Total		508	508	508	508	508	508	3048

Appendix (E):
Descriptive Statistics for FAH Branded Meat Expenditures 2002-2007

NB_Pork Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
NB_Pork	0	Count	914	893	609	603	502	539	4060
		% within NB_Pork	22.5%	22.0%	15.0%	14.9%	12.4%	13.3%	100.0%
		% within YEAR	88.8%	86.8%	59.2%	58.6%	48.8%	52.4%	65.8%
	1. [$0-25]	Count	105	121	328	317	392	371	1634
		% within NB_Pork	6.4%	7.4%	20.1%	19.4%	24.0%	22.7%	100.0%
		% within YEAR	10.2%	11.8%	31.9%	30.8%	38.1%	36.1%	26.5%
	2. [$25-50]	Count	7	12	76	77	95	88	355
		% within NB_Pork	2.0%	3.4%	21.4%	21.7%	26.8%	24.8%	100.0%
		% within YEAR	.7%	1.2%	7.4%	7.5%	9.2%	8.6%	5.7%
	3. [$50-100]	Count	3	2	12	25	34	28	104
		% within NB_Pork	2.9%	1.9%	11.5%	24.0%	32.7%	26.9%	100.0%
		% within YEAR	.3%	.2%	1.2%	2.4%	3.3%	2.7%	1.7%
	4. [$100-300	Count	0	1	4	7	6	3	21
		% within NB_Pork	.0%	4.8%	19.0%	33.3%	28.6%	14.3%	100.0%
		% within YEAR	.0%	.1%	.4%	.7%	.6%	.3%	.3%
Total	**Total**	Count	1029	1029	1029	1029	1029	1029	6174
		% within NB_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Pork Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
PL_Pork	0	Count	993	984	854	815	830	848	5324
		% within PL_Pork	18.7%	18.5%	16.0%	15.3%	15.6%	15.9%	100.0%
		% within YEAR	96.5%	95.6%	83.0%	79.2%	80.7%	82.4%	86.2%
	1. [$0-25]	Count	35	41	140	167	161	149	693
		% within PL_Pork	5.1%	5.9%	20.2%	24.1%	23.2%	21.5%	100.0%
		% within YEAR	3.4%	4.0%	13.6%	16.2%	15.6%	14.5%	11.2%
	2. [$25-50]	Count	1	1	24	35	25	21	107
		% within PL_Pork	.9%	.9%	22.4%	32.7%	23.4%	19.6%	100.0%
		% within YEAR	.1%	.1%	2.3%	3.4%	2.4%	2.0%	1.7%
	3. [$50-100]	Count	0	3	10	10	11	9	43
		% within PL_Pork	.0%	7.0%	23.3%	23.3%	25.6%	20.9%	100.0%
		% within YEAR	.0%	.3%	1.0%	1.0%	1.1%	.9%	.7%
	4. [$100-	Count	0	0	1	2	2	2	7

	300	% within PL_Pork	.0%	.0%	14.3%	28.6%	28.6%	28.6%	100.0%
		% within YEAR	.0%	.0%	.1%	.2%	.2%	.2%	.1%
Total	**Total**	Count	1029	1029	1029	1029	1029	1029	6174
		% within PL_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Poultry Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
NB_Poultry	0	Count	649	721	744	707	733	763	4317
		% within NB_Poultry	15.0%	16.7%	17.2%	16.4%	17.0%	17.7%	100.0%
		% within YEAR	63.1%	70.1%	72.3%	68.7%	71.2%	74.1%	69.9%
	1. [$0-25]	Count	259	215	194	226	199	175	1268
		% within NB_Poultry	20.4%	17.0%	15.3%	17.8%	15.7%	13.8%	100.0%
		% within YEAR	25.2%	20.9%	18.9%	22.0%	19.3%	17.0%	20.5%
	2. [$25-50]	Count	73	48	52	54	59	58	344
		% within NB_Poultry	21.2%	14.0%	15.1%	15.7%	17.2%	16.9%	100.0%
		% within YEAR	7.1%	4.7%	5.1%	5.2%	5.7%	5.6%	5.6%
	3. [$50-100]	Count	37	37	23	26	29	27	179
		% within NB_Poultry	20.7%	20.7%	12.8%	14.5%	16.2%	15.1%	100.0%
		% within YEAR	3.6%	3.6%	2.2%	2.5%	2.8%	2.6%	2.9%
	4. [$100-300	Count	11	8	16	16	9	6	66
		% within NB_Poultry	16.7%	12.1%	24.2%	24.2%	13.6%	9.1%	100.0%
		% within YEAR	1.1%	.8%	1.6%	1.6%	.9%	.6%	1.1%
Total	**Total**	Count	1029	1029	1029	1029	1029	1029	6174
		% within NB_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Poultry Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
PL_Poultry	0	Count	534	511	539	585	543	626	3338
		% within PL_Poultry	16.0%	15.3%	16.1%	17.5%	16.3%	18.8%	100.0%
		% within YEAR	51.9%	49.7%	52.4%	56.9%	52.8%	60.8%	54.1%
	1. [$0-25]	Count	277	294	260	249	322	256	1658
		% within PL_Poultry	16.7%	17.7%	15.7%	15.0%	19.4%	15.4%	100.0%

		% within YEAR	26.9%	28.6%	25.3%	24.2%	31.3%	24.9%	26.9%
	2. [$25-50]	Count	112	100	92	100	83	64	551
		% within PL_Poultry	20.3%	18.1%	16.7%	18.1%	15.1%	11.6%	100.0%
		% within YEAR	10.9%	9.7%	8.9%	9.7%	8.1%	6.2%	8.9%
	3. [$50-100]	Count	67	67	77	54	44	50	359
		% within PL_Poultry	18.7%	18.7%	21.4%	15.0%	12.3%	13.9%	100.0%
		% within YEAR	6.5%	6.5%	7.5%	5.2%	4.3%	4.9%	5.8%
	4. [$100-300	Count	38	53	59	41	36	31	258
		% within PL_Poultry	14.7%	20.5%	22.9%	15.9%	14.0%	12.0%	100.0%
		% within YEAR	3.7%	5.2%	5.7%	4.0%	3.5%	3.0%	4.2%
	5. [$300-500]	Count	1	4	2	0	1	2	10
		% within PL_Poultry	10.0%	40.0%	20.0%	.0%	10.0%	20.0%	100.0%
		% within YEAR	.1%	.4%	.2%	.0%	.1%	.2%	.2%
Total	**Total**	Count	1029	1029	1029	1029	1029	1029	6174
		% within PL_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Others Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
NB_Others	0	Count	516	481	425	352	356	376	2506
		% within NB_Others	20.6%	19.2%	17.0%	14.0%	14.2%	15.0%	100.0%
		% within YEAR	50.1%	46.7%	41.3%	34.2%	34.6%	36.5%	40.6%
	1. [$0-25]	Count	336	356	358	388	386	385	2209
		% within NB_Others	15.2%	16.1%	16.2%	17.6%	17.5%	17.4%	100.0%
		% within YEAR	32.7%	34.6%	34.8%	37.7%	37.5%	37.4%	35.8%
	2. [$25-50]	Count	112	120	142	167	154	132	827
		% within NB_Others	13.5%	14.5%	17.2%	20.2%	18.6%	16.0%	100.0%
		% within YEAR	10.9%	11.7%	13.8%	16.2%	15.0%	12.8%	13.4%
	3. [$50-100]	Count	49	54	75	87	94	94	453
		% within NB_Others	10.8%	11.9%	16.6%	19.2%	20.8%	20.8%	100.0%
		% within YEAR	4.8%	5.2%	7.3%	8.5%	9.1%	9.1%	7.3%
	4. [$100-300	Count	16	18	28	35	38	41	176
		% within NB_Others	9.1%	10.2%	15.9%	19.9%	21.6%	23.3%	100.0%
		% within YEAR	1.6%	1.7%	2.7%	3.4%	3.7%	4.0%	2.9%
	5. [$300-	Count	0	0	1	0	1	1	3

	500]	% within NB_Others	.0%	.0%	33.3%	.0%	33.3%	33.3%	100.0%
		% within YEAR	.0%	.0%	.1%	.0%	.1%	.1%	.0%
Total	**Total**	Count	1029	1029	1029	1029	1029	1029	6174
		% within NB_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Others Expenditure (CAN$) Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
PL_Others	0	Count	692	664	629	609	560	600	3754
		% within PL_Others	18.4%	17.7%	16.8%	16.2%	14.9%	16.0%	100.0%
		% within YEAR	67.2%	64.5%	61.1%	59.2%	54.4%	58.3%	60.8%
	1. [$0-25]	Count	239	242	277	264	294	265	1581
		% within PL_Others	15.1%	15.3%	17.5%	16.7%	18.6%	16.8%	100.0%
		% within YEAR	23.2%	23.5%	26.9%	25.7%	28.6%	25.8%	25.6%
	2. [$25-50]	Count	53	64	68	86	96	95	462
		% within PL_Others	11.5%	13.9%	14.7%	18.6%	20.8%	20.6%	100.0%
		% within YEAR	5.2%	6.2%	6.6%	8.4%	9.3%	9.2%	7.5%
	3. [$50-100]	Count	27	34	42	50	59	48	260
		% within PL_Others	10.4%	13.1%	16.2%	19.2%	22.7%	18.5%	100.0%
		% within YEAR	2.6%	3.3%	4.1%	4.9%	5.7%	4.7%	4.2%
	4. [$100-300	Count	17	24	12	19	19	19	110
		% within PL_Others	15.5%	21.8%	10.9%	17.3%	17.3%	17.3%	100.0%
		% within YEAR	1.7%	2.3%	1.2%	1.8%	1.8%	1.8%	1.8%
	5. [$300-500]	Count	1	1	1	1	0	2	6
		% within PL_Others	16.7%	16.7%	16.7%	16.7%	.0%	33.3%	100.0%
		% within YEAR	.1%	.1%	.1%	.1%	.0%	.2%	.1%
	6. [$500+]	Count	0	0	0	0	1	0	1
		% within PL_Others	.0%	.0%	.0%	.0%	100.0%	.0%	100.0%
		% within YEAR	.0%	.0%	.0%	.0%	.1%	.0%	.0%
Total	**Total**	Count	1029	1029	1029	1029	1029	1029	6174
		% within PL_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Pork Expenditure Share Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
NB_Pork	0	Count	914	893	609	603	502	539	4060
		% within NB_Pork	22.5%	22.0%	15.0%	14.9%	12.4%	13.3%	100.0%
		% within YEAR	88.8%	86.8%	59.2%	58.6%	48.8%	52.4%	65.8%
	0-20%	Count	62	67	186	171	220	197	903
		% within NB_Pork	6.9%	7.4%	20.6%	18.9%	24.4%	21.8%	100.0%
		% within YEAR	6.0%	6.5%	18.1%	16.6%	21.4%	19.1%	14.6%
	20-40%	Count	27	32	96	117	135	123	530
		% within NB_Pork	5.1%	6.0%	18.1%	22.1%	25.5%	23.2%	100.0%
		% within YEAR	2.6%	3.1%	9.3%	11.4%	13.1%	12.0%	8.6%
	40-60%	Count	10	10	47	52	62	64	245
		% within NB_Pork	4.1%	4.1%	19.2%	21.2%	25.3%	26.1%	100.0%
		% within YEAR	1.0%	1.0%	4.6%	5.1%	6.0%	6.2%	4.0%
	60-80%	Count	6	8	33	26	45	37	155
		% within NB_Pork	3.9%	5.2%	21.3%	16.8%	29.0%	23.9%	100.0%
		% within YEAR	.6%	.8%	3.2%	2.5%	4.4%	3.6%	2.5%
	80%<	Count	10	19	58	60	65	69	281
		% within NB_Pork	3.6%	6.8%	20.6%	21.4%	23.1%	24.6%	100.0%
		% within YEAR	1.0%	1.8%	5.6%	5.8%	6.3%	6.7%	4.6%
Total		Count	1029	1029	1029	1029	1029	1029	6174
		% within NB_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Pork Expenditure Share Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
PL_Pork	0	Count	993	984	854	815	830	848	5324
		% within PL_Pork	18.7%	18.5%	16.0%	15.3%	15.6%	15.9%	100.0%
		% within YEAR	96.5%	95.6%	83.0%	79.2%	80.7%	82.4%	86.2%
	0-20%	Count	25	24	100	117	127	119	512
		% within PL_Pork	4.9%	4.7%	19.5%	22.9%	24.8%	23.2%	100.0%
		% within YEAR	2.4%	2.3%	9.7%	11.4%	12.3%	11.6%	8.3%
	20-40%	Count	6	10	46	47	39	36	184
		% within PL_Pork	3.3%	5.4%	25.0%	25.5%	21.2%	19.6%	100.0%
		% within YEAR	.6%	1.0%	4.5%	4.6%	3.8%	3.5%	3.0%
	40-60%	Count	1	3	13	26	20	12	75
		% within PL_Pork	1.3%	4.0%	17.3%	34.7%	26.7%	16.0%	100.0%
		% within YEAR	.1%	.3%	1.3%	2.5%	1.9%	1.2%	1.2%
	60-80%	Count	1	2	6	10	7	6	32
		% within PL_Pork	3.1%	6.3%	18.8%	31.3%	21.9%	18.8%	100.0%
		% within YEAR	.1%	.2%	.6%	1.0%	.7%	.6%	.5%

	80%<	Count	3	6	10	14	6	8	47
		% within PL_Pork	6.4%	12.8%	21.3%	29.8%	12.8%	17.0%	100.0%
		% within YEAR	.3%	.6%	1.0%	1.4%	.6%	.8%	.8%
Total		Count	1029	1029	1029	1029	1029	1029	6174
		% within PL_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Poultry Expenditure Share Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
NB_Poultry	0	Count	649	721	744	707	733	763	4317
		% within NB_Poultry	15.0%	16.7%	17.2%	16.4%	17.0%	17.7%	100.0%
		% within YEAR	63.1%	70.1%	72.3%	68.7%	71.2%	74.1%	69.9%
	0-20%	Count	101	112	114	144	134	115	720
		% within NB_Poultry	14.0%	15.6%	15.8%	20.0%	18.6%	16.0%	100.0%
		% within YEAR	9.8%	10.9%	11.1%	14.0%	13.0%	11.2%	11.7%
	20-40%	Count	110	95	80	88	76	73	522
		% within NB_Poultry	21.1%	18.2%	15.3%	16.9%	14.6%	14.0%	100.0%
		% within YEAR	10.7%	9.2%	7.8%	8.6%	7.4%	7.1%	8.5%
	40-60%	Count	78	41	51	55	52	35	312
		% within NB_Poultry	25.0%	13.1%	16.3%	17.6%	16.7%	11.2%	100.0%
		% within YEAR	7.6%	4.0%	5.0%	5.3%	5.1%	3.4%	5.1%
	60-80%	Count	37	24	25	17	17	18	138
		% within NB_Poultry	26.8%	17.4%	18.1%	12.3%	12.3%	13.0%	100.0%
		% within YEAR	3.6%	2.3%	2.4%	1.7%	1.7%	1.7%	2.2%
	80%<	Count	54	36	15	18	17	25	165
		% within NB_Poultry	32.7%	21.8%	9.1%	10.9%	10.3%	15.2%	100.0%
		% within YEAR	5.2%	3.5%	1.5%	1.7%	1.7%	2.4%	2.7%
Total		Count	1029	1029	1029	1029	1029	1029	6174
		% within NB_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Poultry Expenditure Share Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
PL_Poultry	0	Count	534	511	539	585	543	626	3338
		% within	16.0%	15.3%	16.1%	17.5%	16.3%	18.8%	100.0%

		PL_Poultry							
		% within YEAR	51.9%	49.7%	52.4%	56.9%	52.8%	60.8%	54.1%
	0-20%	Count	77	84	100	142	182	134	719
		% within PL_Poultry	10.7%	11.7%	13.9%	19.7%	25.3%	18.6%	100.0%
		% within YEAR	7.5%	8.2%	9.7%	13.8%	17.7%	13.0%	11.6%
	20-40%	Count	133	140	151	128	157	131	840
		% within PL_Poultry	15.8%	16.7%	18.0%	15.2%	18.7%	15.6%	100.0%
		% within YEAR	12.9%	13.6%	14.7%	12.4%	15.3%	12.7%	13.6%
	40-60%	Count	109	109	100	97	82	68	565
		% within PL_Poultry	19.3%	19.3%	17.7%	17.2%	14.5%	12.0%	100.0%
		% within YEAR	10.6%	10.6%	9.7%	9.4%	8.0%	6.6%	9.2%
	60-80%	Count	74	78	72	49	32	32	337
		% within PL_Poultry	22.0%	23.1%	21.4%	14.5%	9.5%	9.5%	100.0%
		% within YEAR	7.2%	7.6%	7.0%	4.8%	3.1%	3.1%	5.5%
	80%<	Count	102	107	67	28	33	38	375
		% within PL_Poultry	27.2%	28.5%	17.9%	7.5%	8.8%	10.1%	100.0%
		% within YEAR	9.9%	10.4%	6.5%	2.7%	3.2%	3.7%	6.1%
Total		Count	1029	1029	1029	1029	1029	1029	6174
		% within PL_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Others Expenditure Share Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
NB_Others	0	Count	516	481	425	352	356	376	2506
		% within NB_Others	20.6%	19.2%	17.0%	14.0%	14.2%	15.0%	100.0%
		% within YEAR	50.1%	46.7%	41.3%	34.2%	34.6%	36.5%	40.6%
	0-20%	Count	116	131	151	158	150	149	855
		% within NB_Others	13.6%	15.3%	17.7%	18.5%	17.5%	17.4%	100.0%
		% within YEAR	11.3%	12.7%	14.7%	15.4%	14.6%	14.5%	13.8%
	20-40%	Count	117	118	136	152	170	161	854
		% within NB_Others	13.7%	13.8%	15.9%	17.8%	19.9%	18.9%	100.0%
		% within YEAR	11.4%	11.5%	13.2%	14.8%	16.5%	15.6%	13.8%
	40-60%	Count	96	99	108	132	144	127	706
		% within NB_Others	13.6%	14.0%	15.3%	18.7%	20.4%	18.0%	100.0%
		% within YEAR	9.3%	9.6%	10.5%	12.8%	14.0%	12.3%	11.4%

	60-80%	Count	65	68	81	73	88	88	463
		% within NB_Others	14.0%	14.7%	17.5%	15.8%	19.0%	19.0%	100.0%
		% within YEAR	6.3%	6.6%	7.9%	7.1%	8.6%	8.6%	7.5%
	80%<	Count	119	132	128	162	121	128	790
		% within NB_Others	15.1%	16.7%	16.2%	20.5%	15.3%	16.2%	100.0%
		% within YEAR	11.6%	12.8%	12.4%	15.7%	11.8%	12.4%	12.8%
Total		Count	1029	1029	1029	1029	1029	1029	6174
		% within NB_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Others Expenditure Share Summary, proportion of households in Ontario 2002-2007

			YEAR						Total
			2002	2003	2004	2005	2006	2007	
PL_Others	0	Count	692	664	629	609	560	600	3754
		% within PL_Others	18.4%	17.7%	16.8%	16.2%	14.9%	16.0%	100.0%
		% within YEAR	67.2%	64.5%	61.1%	59.2%	54.4%	58.3%	60.8%
	0-20%	Count	127	112	172	153	156	135	855
		% within PL_Others	14.9%	13.1%	20.1%	17.9%	18.2%	15.8%	100.0%
		% within YEAR	12.3%	10.9%	16.7%	14.9%	15.2%	13.1%	13.8%
	20-40%	Count	83	98	117	136	163	126	723
		% within PL_Others	11.5%	13.6%	16.2%	18.8%	22.5%	17.4%	100.0%
		% within YEAR	8.1%	9.5%	11.4%	13.2%	15.8%	12.2%	11.7%
	40-60%	Count	48	61	51	72	77	84	393
		% within PL_Others	12.2%	15.5%	13.0%	18.3%	19.6%	21.4%	100.0%
		% within YEAR	4.7%	5.9%	5.0%	7.0%	7.5%	8.2%	6.4%
	60-80%	Count	28	37	27	32	40	38	202
		% within PL_Others	13.9%	18.3%	13.4%	15.8%	19.8%	18.8%	100.0%
		% within YEAR	2.7%	3.6%	2.6%	3.1%	3.9%	3.7%	3.3%
	80%<	Count	51	57	33	27	33	46	247
		% within PL_Others	20.6%	23.1%	13.4%	10.9%	13.4%	18.6%	100.0%
		% within YEAR	5.0%	5.5%	3.2%	2.6%	3.2%	4.5%	4.0%
Total		Count	1029	1029	1029	1029	1029	1029	6174
		% within PL_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within YEAR	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Pork Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
NB_Pork	0	Count	364	354	297	289	304	302	1910
		% within NB_Pork	19.1%	18.5%	15.5%	15.1%	15.9%	15.8%	100.0%

		% within Year	72.5%	70.5%	59.2%	57.6%	60.6%	60.2%	63.4%
	1. [$0-25]	Count	106	117	142	165	150	155	835
		% within NB_Pork	12.7%	14.0%	17.0%	19.8%	18.0%	18.6%	100.0%
		% within Year	21.1%	23.3%	28.3%	32.9%	29.9%	30.9%	27.7%
	2. [$25-50]	Count	26	28	46	38	37	36	211
		% within NB_Pork	12.3%	13.3%	21.8%	18.0%	17.5%	17.1%	100.0%
		% within Year	5.2%	5.6%	9.2%	7.6%	7.4%	7.2%	7.0%
	3. [$50-100]	Count	6	3	12	8	9	9	47
		% within NB_Pork	12.8%	6.4%	25.5%	17.0%	19.1%	19.1%	100.0%
		% within Year	1.2%	.6%	2.4%	1.6%	1.8%	1.8%	1.6%
	4. [$100-300]	Count	0	0	5	2	2	0	9
		% within NB_Pork	.0%	.0%	55.6%	22.2%	22.2%	.0%	100.0%
		% within Year	.0%	.0%	1.0%	.4%	.4%	.0%	.3%
Total		Count	502	502	502	502	502	502	3012
		% within NB_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Pork Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
PL_Pork	0	Count	484	471	409	382	410	383	2539
		% within PL_Pork	19.1%	18.6%	16.1%	15.0%	16.1%	15.1%	100.0%
		% within Year	96.4%	93.8%	81.5%	76.1%	81.7%	76.3%	84.3%
	1. [$0-25]	Count	17	23	77	98	67	80	362
		% within PL_Pork	4.7%	6.4%	21.3%	27.1%	18.5%	22.1%	100.0%
		% within Year	3.4%	4.6%	15.3%	19.5%	13.3%	15.9%	12.0%
	2. [$25-50]	Count	1	7	14	17	17	30	86
		% within PL_Pork	1.2%	8.1%	16.3%	19.8%	19.8%	34.9%	100.0%
		% within Year	.2%	1.4%	2.8%	3.4%	3.4%	6.0%	2.9%
	3. [$50-100]	Count	0	1	1	4	7	5	18
		% within PL_Pork	.0%	5.6%	5.6%	22.2%	38.9%	27.8%	100.0%
		% within Year	.0%	.2%	.2%	.8%	1.4%	1.0%	.6%
	4. [$100-300]	Count	0	0	1	1	1	4	7
		% within PL_Pork	.0%	.0%	14.3%	14.3%	14.3%	57.1%	100.0%
		% within Year	.0%	.0%	.2%	.2%	.2%	.8%	.2%
Total		Count	502	502	502	502	502	502	3012
		% within PL_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Poultry Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

	Year						Total
	2002	2003	2004	2005	2006	2007	

NB_Poultry	0	Count	365	341	339	351	347	339	2082
		% within NB_Poultry	17.5%	16.4%	16.3%	16.9%	16.7%	16.3%	100.0%
		% within Year	72.7%	67.9%	67.5%	69.9%	69.1%	67.5%	69.1%
	1. [$0-25]	Count	91	114	112	96	99	94	606
		% within NB_Poultry	15.0%	18.8%	18.5%	15.8%	16.3%	15.5%	100.0%
		% within Year	18.1%	22.7%	22.3%	19.1%	19.7%	18.7%	20.1%
	2. [$25-50]	Count	22	27	24	32	25	35	165
		% within NB_Poultry	13.3%	16.4%	14.5%	19.4%	15.2%	21.2%	100.0%
		% within Year	4.4%	5.4%	4.8%	6.4%	5.0%	7.0%	5.5%
	3. [$50-100]	Count	15	10	16	17	21	23	102
		% within NB_Poultry	14.7%	9.8%	15.7%	16.7%	20.6%	22.5%	100.0%
		% within Year	3.0%	2.0%	3.2%	3.4%	4.2%	4.6%	3.4%
	4. [$100-300]	Count	9	10	11	5	10	11	56
		% within NB_Poultry	16.1%	17.9%	19.6%	8.9%	17.9%	19.6%	100.0%
		% within Year	1.8%	2.0%	2.2%	1.0%	2.0%	2.2%	1.9%
	5. [$300-500]	Count	0	0	0	1	0	0	1
		% within NB_Poultry	.0%	.0%	.0%	100.0%	.0%	.0%	100.0%
		% within Year	.0%	.0%	.0%	.2%	.0%	.0%	.0%
Total		Count	502	502	502	502	502	502	3012
		% within NB_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Poultry Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
PL_Poultry	0	Count	292	309	312	313	344	326	1896
		% within PL_Poultry	15.4%	16.3%	16.5%	16.5%	18.1%	17.2%	100.0%
		% within Year	58.2%	61.6%	62.2%	62.4%	68.5%	64.9%	62.9%
	1. [$0-25]	Count	103	100	111	107	82	97	600
		% within PL_Poultry	17.2%	16.7%	18.5%	17.8%	13.7%	16.2%	100.0%
		% within Year	20.5%	19.9%	22.1%	21.3%	16.3%	19.3%	19.9%
	2. [$25-50]	Count	56	51	45	39	36	46	273
		% within PL_Poultry	20.5%	18.7%	16.5%	14.3%	13.2%	16.8%	100.0%
		% within Year	11.2%	10.2%	9.0%	7.8%	7.2%	9.2%	9.1%
	3. [$50-100]	Count	32	26	22	25	34	22	161
		% within	19.9%	16.1%	13.7%	15.5%	21.1%	13.7%	100.0%

		PL_Poultry							
		% within Year	6.4%	5.2%	4.4%	5.0%	6.8%	4.4%	5.3%
	4. [$100-300]	Count	19	16	11	18	6	11	81
		% within PL_Poultry	23.5%	19.8%	13.6%	22.2%	7.4%	13.6%	100.0%
		% within Year	3.8%	3.2%	2.2%	3.6%	1.2%	2.2%	2.7%
	5. [$300-500]	Count	0	0	1	0	0	0	1
		% within PL_Poultry	.0%	.0%	100.0%	.0%	.0%	.0%	100.0%
		% within Year	.0%	.0%	.2%	.0%	.0%	.0%	.0%
Total		Count	502	502	502	502	502	502	3012
		% within PL_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Others Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
NB_Others	0	Count	224	206	185	173	160	169	1117
		% within NB_Others	20.1%	18.4%	16.6%	15.5%	14.3%	15.1%	100.0%
		% within Year	44.6%	41.0%	36.9%	34.5%	31.9%	33.7%	37.1%
	1. [$0-25]	Count	182	169	145	161	191	173	1021
		% within NB_Others	17.8%	16.6%	14.2%	15.8%	18.7%	16.9%	100.0%
		% within Year	36.3%	33.7%	28.9%	32.1%	38.0%	34.5%	33.9%
	2. [$25-50]	Count	64	83	82	85	94	79	487
		% within NB_Others	13.1%	17.0%	16.8%	17.5%	19.3%	16.2%	100.0%
		% within Year	12.7%	16.5%	16.3%	16.9%	18.7%	15.7%	16.2%
	3. [$50-100]	Count	27	35	62	63	42	59	288
		% within NB_Others	9.4%	12.2%	21.5%	21.9%	14.6%	20.5%	100.0%
		% within Year	5.4%	7.0%	12.4%	12.5%	8.4%	11.8%	9.6%
	4. [$100-300]	Count	5	9	28	19	15	22	98
		% within NB_Others	5.1%	9.2%	28.6%	19.4%	15.3%	22.4%	100.0%
		% within Year	1.0%	1.8%	5.6%	3.8%	3.0%	4.4%	3.3%
	5. [$300-500]	Count	0	0	0	1	0	0	1
		% within NB_Others	.0%	.0%	.0%	100.0%	.0%	.0%	100.0%
		% within Year	.0%	.0%	.0%	.2%	.0%	.0%	.0%
Total		Count	502	502	502	502	502	502	3012
		% within NB_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Others Expenditure (CAN$) Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
PL_Others	0	Count	390	395	343	349	356	358	2191
		% within PL_Others	17.8%	18.0%	15.7%	15.9%	16.2%	16.3%	100.0%
		% within Year	77.7%	78.7%	68.3%	69.5%	70.9%	71.3%	72.7%
	1. [$0-25]	Count	84	72	123	117	97	109	602
		% within PL_Others	14.0%	12.0%	20.4%	19.4%	16.1%	18.1%	100.0%
		% within Year	16.7%	14.3%	24.5%	23.3%	19.3%	21.7%	20.0%
	2. [$25-50]	Count	18	20	18	21	28	21	126
		% within PL_Others	14.3%	15.9%	14.3%	16.7%	22.2%	16.7%	100.0%
		% within Year	3.6%	4.0%	3.6%	4.2%	5.6%	4.2%	4.2%
	3. [$50-100]	Count	10	13	10	10	15	9	67
		% within PL_Others	14.9%	19.4%	14.9%	14.9%	22.4%	13.4%	100.0%
		% within Year	2.0%	2.6%	2.0%	2.0%	3.0%	1.8%	2.2%
	4. [$100-300]	Count	0	2	8	5	6	5	26
		% within PL_Others	.0%	7.7%	30.8%	19.2%	23.1%	19.2%	100.0%
		% within Year	.0%	.4%	1.6%	1.0%	1.2%	1.0%	.9%
Total		Count	502	502	502	502	502	502	3012
		% within PL_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Pork Expenditure Share Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
NB_Pork	0	Count	364	354	297	289	304	302	1910
		% within NB_Pork	19.1%	18.5%	15.5%	15.1%	15.9%	15.8%	100.0%
		% within Year	72.5%	70.5%	59.2%	57.6%	60.6%	60.2%	63.4%
	0-20%	Count	40	51	77	89	70	75	402
		% within NB_Pork	10.0%	12.7%	19.2%	22.1%	17.4%	18.7%	100.0%
		% within Year	8.0%	10.2%	15.3%	17.7%	13.9%	14.9%	13.3%
	20-40%	Count	30	37	58	57	53	60	295
		% within NB_Pork	10.2%	12.5%	19.7%	19.3%	18.0%	20.3%	100.0%
		% within Year	6.0%	7.4%	11.6%	11.4%	10.6%	12.0%	9.8%
	40-60%	Count	26	22	27	29	29	30	163
		% within NB_Pork	16.0%	13.5%	16.6%	17.8%	17.8%	18.4%	100.0%

		% within Year	5.2%	4.4%	5.4%	5.8%	5.8%	6.0%	5.4%
	60-80%	Count	12	13	17	15	13	5	75
		% within NB_Pork	16.0%	17.3%	22.7%	20.0%	17.3%	6.7%	100.0%
		% within Year	2.4%	2.6%	3.4%	3.0%	2.6%	1.0%	2.5%
	80%<	Count	30	25	26	23	33	30	167
		% within NB_Pork	18.0%	15.0%	15.6%	13.8%	19.8%	18.0%	100.0%
		% within Year	6.0%	5.0%	5.2%	4.6%	6.6%	6.0%	5.5%
Total		Count	502	502	502	502	502	502	3012
		% within NB_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Pork Expenditure Share Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
PL_Pork	0	Count	484	471	409	382	410	383	2539
		% within PL_Pork	19.1%	18.6%	16.1%	15.0%	16.1%	15.1%	100.0%
		% within Year	96.4%	93.8%	81.5%	76.1%	81.7%	76.3%	84.3%
	0-20%	Count	5	15	54	64	41	48	227
		% within PL_Pork	2.2%	6.6%	23.8%	28.2%	18.1%	21.1%	100.0%
		% within Year	1.0%	3.0%	10.8%	12.7%	8.2%	9.6%	7.5%
	20-40%	Count	4	10	18	24	24	35	115
		% within PL_Pork	3.5%	8.7%	15.7%	20.9%	20.9%	30.4%	100.0%
		% within Year	.8%	2.0%	3.6%	4.8%	4.8%	7.0%	3.8%
	40-60%	Count	6	0	9	11	12	17	55
		% within PL_Pork	10.9%	.0%	16.4%	20.0%	21.8%	30.9%	100.0%
		% within Year	1.2%	.0%	1.8%	2.2%	2.4%	3.4%	1.8%
	60-80%	Count	0	3	5	9	6	5	28
		% within PL_Pork	.0%	10.7%	17.9%	32.1%	21.4%	17.9%	100.0%
		% within Year	.0%	.6%	1.0%	1.8%	1.2%	1.0%	.9%
	80%<	Count	3	3	7	12	9	14	48
		% within PL_Pork	6.3%	6.3%	14.6%	25.0%	18.8%	29.2%	100.0%
		% within Year	.6%	.6%	1.4%	2.4%	1.8%	2.8%	1.6%
Total		Count	502	502	502	502	502	502	3012
		% within PL_Pork	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Poultry Expenditure Share Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
NB_Poultry	0	Count	365	341	339	351	347	339	2082
		% within NB_Poultry	17.5%	16.4%	16.3%	16.9%	16.7%	16.3%	100.0%

		% within Year	72.7%	67.9%	67.5%	69.9%	69.1%	67.5%	69.1%
	0-20%	Count	45	43	74	61	56	61	340
		% within NB_Poultry	13.2%	12.6%	21.8%	17.9%	16.5%	17.9%	100.0%
		% within Year	9.0%	8.6%	14.7%	12.2%	11.2%	12.2%	11.3%
	20-40%	Count	27	51	39	38	40	37	232
		% within NB_Poultry	11.6%	22.0%	16.8%	16.4%	17.2%	15.9%	100.0%
		% within Year	5.4%	10.2%	7.8%	7.6%	8.0%	7.4%	7.7%
	40-60%	Count	24	23	17	22	34	32	152
		% within NB_Poultry	15.8%	15.1%	11.2%	14.5%	22.4%	21.1%	100.0%
		% within Year	4.8%	4.6%	3.4%	4.4%	6.8%	6.4%	5.0%
	60-80%	Count	21	14	19	10	4	20	88
		% within NB_Poultry	23.9%	15.9%	21.6%	11.4%	4.5%	22.7%	100.0%
		% within Year	4.2%	2.8%	3.8%	2.0%	.8%	4.0%	2.9%
	80%<	Count	20	30	14	20	21	13	118
		% within NB_Poultry	16.9%	25.4%	11.9%	16.9%	17.8%	11.0%	100.0%
		% within Year	4.0%	6.0%	2.8%	4.0%	4.2%	2.6%	3.9%
Total		Count	502	502	502	502	502	502	3012
		% within NB_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Poultry Expenditure Share Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
PL_Poultry	0	Count	292	309	312	313	344	326	1896
		% within PL_Poultry	15.4%	16.3%	16.5%	16.5%	18.1%	17.2%	100.0%
		% within Year	58.2%	61.6%	62.2%	62.4%	68.5%	64.9%	62.9%
	0-20%	Count	27	31	52	53	32	55	250
		% within PL_Poultry	10.8%	12.4%	20.8%	21.2%	12.8%	22.0%	100.0%
		% within Year	5.4%	6.2%	10.4%	10.6%	6.4%	11.0%	8.3%
	20-40%	Count	57	48	71	54	54	50	334
		% within PL_Poultry	17.1%	14.4%	21.3%	16.2%	16.2%	15.0%	100.0%
		% within Year	11.4%	9.6%	14.1%	10.8%	10.8%	10.0%	11.1%
	40-60%	Count	50	46	36	35	43	34	244
		% within PL_Poultry	20.5%	18.9%	14.8%	14.3%	17.6%	13.9%	100.0%
		% within Year	10.0%	9.2%	7.2%	7.0%	8.6%	6.8%	8.1%
	60-80%	Count	31	31	14	30	19	24	149

		% within PL_Poultry	20.8%	20.8%	9.4%	20.1%	12.8%	16.1%	100.0%
		% within Year	6.2%	6.2%	2.8%	6.0%	3.8%	4.8%	4.9%
	80%<	Count	45	37	17	17	10	13	139
		% within PL_Poultry	32.4%	26.6%	12.2%	12.2%	7.2%	9.4%	100.0%
		% within Year	9.0%	7.4%	3.4%	3.4%	2.0%	2.6%	4.6%
Total		Count	502	502	502	502	502	502	3012
		% within PL_Poultry	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

NB_Others Expenditure Share Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
NB_Others	0	Count	224	206	185	173	160	169	1117
		% within NB_Others	20.1%	18.4%	16.6%	15.5%	14.3%	15.1%	100.0%
		% within Year	44.6%	41.0%	36.9%	34.5%	31.9%	33.7%	37.1%
	0-20%	Count	58	60	52	51	69	63	353
		% within NB_Others	16.4%	17.0%	14.7%	14.4%	19.5%	17.8%	100.0%
		% within Year	11.6%	12.0%	10.4%	10.2%	13.7%	12.5%	11.7%
	20-40%	Count	73	59	63	75	76	69	415
		% within NB_Others	17.6%	14.2%	15.2%	18.1%	18.3%	16.6%	100.0%
		% within Year	14.5%	11.8%	12.5%	14.9%	15.1%	13.7%	13.8%
	40-60%	Count	48	48	70	63	76	69	374
		% within NB_Others	12.8%	12.8%	18.7%	16.8%	20.3%	18.4%	100.0%
		% within Year	9.6%	9.6%	13.9%	12.5%	15.1%	13.7%	12.4%
	60-80%	Count	28	43	63	62	34	43	273
		% within NB_Others	10.3%	15.8%	23.1%	22.7%	12.5%	15.8%	100.0%
		% within Year	5.6%	8.6%	12.5%	12.4%	6.8%	8.6%	9.1%
	80%<	Count	71	86	69	78	87	89	480
		% within NB_Others	14.8%	17.9%	14.4%	16.3%	18.1%	18.5%	100.0%
		% within Year	14.1%	17.1%	13.7%	15.5%	17.3%	17.7%	15.9%
Total		Count	502	502	502	502	502	502	3012
		% within NB_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

PL_Others Expenditure Share Summary, proportion of households in Alberta 2002-2007

			Year						Total
			2002	2003	2004	2005	2006	2007	
PL_Others	0	Count	390	395	343	349	356	358	2191
		% within PL_Others	17.8%	18.0%	15.7%	15.9%	16.2%	16.3%	100.0%
		% within Year	77.7%	78.7%	68.3%	69.5%	70.9%	71.3%	72.7%
	0-20%	Count	38	41	68	74	53	57	331
		% within PL_Others	11.5%	12.4%	20.5%	22.4%	16.0%	17.2%	100.0%
		% within Year	7.6%	8.2%	13.5%	14.7%	10.6%	11.4%	11.0%
	20-40%	Count	35	24	43	39	46	41	228
		% within PL_Others	15.4%	10.5%	18.9%	17.1%	20.2%	18.0%	100.0%
		% within Year	7.0%	4.8%	8.6%	7.8%	9.2%	8.2%	7.6%
	40-60%	Count	18	15	22	19	24	19	117
		% within PL_Others	15.4%	12.8%	18.8%	16.2%	20.5%	16.2%	100.0%
		% within Year	3.6%	3.0%	4.4%	3.8%	4.8%	3.8%	3.9%
	60-80%	Count	6	15	11	15	13	10	70
		% within PL_Others	8.6%	21.4%	15.7%	21.4%	18.6%	14.3%	100.0%
		% within Year	1.2%	3.0%	2.2%	3.0%	2.6%	2.0%	2.3%
	80%<	Count	15	12	15	6	10	17	75
		% within PL_Others	20.0%	16.0%	20.0%	8.0%	13.3%	22.7%	100.0%
		% within Year	3.0%	2.4%	3.0%	1.2%	2.0%	3.4%	2.5%
Total		Count	502	502	502	502	502	502	3012
		% within PL_Others	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%	100.0%
		% within Year	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%