RURAL ECONOMY

Analysis of Value-Added Meat Product Choice Behaviour by Canadian Households

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Project Report # 10-04

Project Report

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Abstract

The competitive landscape in retailing has changed over the past decade. Moreover, the degree of product differentiation has been increasing: households are able to choose between an increasing number of store brands and national brands of similar products. The value added meat market is no different than any other sector of the grocery market – both national brands and private label brands are being developed to appeal to the consumer's desire for convenience, health, production and environmental attributes. Understanding the factors that are influencing consumers' value added meat product preferences is important for meat manufacturers who wish to add value to their firm's 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 objective of the paper is to provide information on value added meat consumption patterns in Canada at the household level using household purchase information from a representative sample of the Canadian population collected through Nielsen Homescan™. Specifically the focus is on how meat consumers make their decision to purchase value-added meat products – the impact of value added meat types, store choices and brands preference on meat demand.

The study undertakes an empirical investigation of Canadian household value added meat demand for the period 2002 to 2007. A comparison of consumers' preferences is performed with respect to store-switching, brand loyalty and meat expenditure. Multivariate regression analysis is employed to explain consumer preferences for the examined stores, products and brands. We find that meat price, advertising, the number of stores visited, household socio-demographic characteristics and regional segments are strongly related to meat expenditure levels. Value added meat product preferences vary widely across meat types - for example, consumer behaviour towards pork is not a good predictor of behaviour towards poultry, in terms of national brand/store brand choice. The data developed in this analysis can highlight

marketing opportunities that exist for meat producers and processors to increase the value of total sales for their particular products. The results of this study highlight the impact of number of stores regularly shopped at on purchases of national brand versus private label meat products, the impact of expenditure on meat by product form on national brand versus private label and the impact of demographic and regional variables on all meat purchases, by animal species.

JEL Codes: D1, M3

Keywords: consumer behaviour, store loyalty, meat demand, value-added meat,

national/store brand choice

Background

The Canadian meat sector is important to the Canadian economy. The meat processing industry is the largest food manufacturing industry. Changes in meat demand can have an impact on all segments of the food chain, which include agricultural input suppliers, farmers, processors, and distributors (Agriculture and Agri-Food Canada, 2009). Meat is an important component in the Canadian diet and it has been found to be the primary source of fat for both children and adults (Statistics Canada, 2007). Thus, understanding the factors that are influencing meat and value added meat demand in Canada is important for the Canadian agricultural sector. Moreover understanding consumer preferences for meat is increasingly important in the context of health concerns, animal disease and food safety outbreaks.

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 it as the largest sector of the Canadian food manufacturing industry. Various processed meat products, including fresh/frozen, semi-processed, and processed meats (like smoked and cooked meats), as well as deli and sausage meats are well established in the marketplace and produced by Canada's meat processing companies. An increasing number of meat producers are expanding into niche markets, for example organic, and into value-added meat products (Agriculture and Agri-Food Canada, 2009).

In 2008, Canada's inventory of cattle and calves were 13.18 million on approximately 86,520 farms and ranches. With approximately 41 percent of this inventory, Alberta was the largest

cattle province. Farm cash receipts from the sale of cattle and calves in 2008 were $6.6 billion which represented 14 percent of total farm receipts. In the same year, in Canada, there were 12.4 million hogs on approximately 8,510 farms and 808,200 sheep and lambs on approximately 12,000 farms. Nearly three quarters of Canadian sheep production was located in Alberta, Ontario and Quebec. Farm cash receipts for sheep and lamb in 2008 were $124 million. 1.2 million tonnes of poultry meat were produced in 2008. The value of all poultry products was $3.2 billion in 2008. (Agriculture and Agri-Food Canada, 2009)\

Furthermore, the meat industry has undergone significant structural change in recent decades. The use of cost advantage strategies (low cost) and the use of more intensive product differentiation are only two examples of the strategies being pursued in the current meat industry. Intensification, concentration, and specialization are three structural forces behind meat industrialization (Bowler, 1985). As an example, Stull and Broadway (2004) suggest that industrialization in the meat industry has been focused on large volume production of uniform products at the lowest possible price, resulting in high-efficiency, high-volume cattle slaughter-dressing facilities. (Stull and Broadway, 2004).

Food retailing—store and brand choice

Retailers are the closest and most frequent point of contact for consumers to the meat industry and they can directly influence household meat consumption. In 2008, Canadian consumers spent around $69 billion on food in retail stores (Statistics Canada, 2009). 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, Superstore and Costco (Agriculture and Agri-Food Canada, 2008). In 2005, approximately three quarters of the $71 billion in food and non-alcoholic sales were distributed through large chains (e.g., Loblaws, Sobeys, 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 added and product differentiation has been increasing: households are able to choose between private label and national brands of similar products (Sethuraman, 2003; Bonfrer and Chintagunta, 2004; Debbie, 2004; Hansen et al., 2006; Hassan and Monier-Dilhan, 2006; Tyagi, 2006; Kusum et al., 2008). The private label business consists of two categories: "premium" private label such as President's Choice (Loblaws) or Our Compliments (Sobeys), and "generic" such as no name and unbranded products. Private label brands have become one of the primary tools 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 the profit potential.

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 meat preferences s shifted from pork and beef to poultry meats (Chen and Veeman, 1991; Reynolds and Goddard, 1991).

The 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. 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 increased by 136 per cent from 12.9 kg in 1975 to 30.6 kg in 2005 (Statistics Canada, 2008). Possibly due to Canadian consumers' health perceptions, chicken meat consumption has grown.

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, 10th, 2009

Additionally another factor potentially affecting the demand for meat products is the changes in Canadian consumer dietary patterns over the past forty years. Many consumers want ready-made convenience food products, therefore there is an increasing demand for value-added meat 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" are found to be closely linked to food at home consumption. Thus, more new meat products to 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 can be 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)

Factors affecting meat demand

Aggregate consumers' food demand is potentially influenced by factors such as population growth, demographic profiles, changing household structure, changing consumer attitudes, advertising, food safety and growth of the economy. Population demographics, perceptions, awareness and attitudes are the key factors that influence meat demand (Verbeke et al., 2000; Reynolds-Zayak, 2004). Monitoring these factors over time can provide a comprehensive understanding of current consumer trends.

1. **Household income and food expenditures**

The household's income, to a large extent, influences what foods and what amount of foods are bought (Stewart and Blisard, 2008). Households will spend more of their food dollar on meat consumption as income increases if meat is 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 income increased, meat consumption increased at an annual rate of 1 per cent (Statistics Canada, 2008).

2. **Household size**

An important trend impacting 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 Canadians choose to live alone and married couples often live without children, thus the demand for smaller servings of foods and foods that require minimal preparation is increasing.

3. **Population, Immigration, Education**

Growth in food consumption is closely linked to population growth (Boserup, 1989). Canada's population is becoming more ethnically diverse and older. Canadian food patterns are influenced as much by the food preferences brought by immigrants from their home countries, as by exposure of the general population to different foods and methods of preparation. Education also plays an important role in the food demand of household.

4. Health and Nutrition

Health-related attitudes influence food choice and consumption (Steptoe et al., 1995; Geeroms et al., 2008; Hailu et al., 2009). Consumers are concerned that the food they eat may be harmful to their health (Holm and Kildevang, 1996). Research has shown that meat consumption has some relationship with colorectal cancer risk (Norat and Riboli, 2001) and breast and prostate cancers (Biesalski, 2002). At the same time red meats are a good source of iron, something lacking in many Canadian's diets. Thus, a significant proportion of consumers are aware of both the health benefits and risks in their 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.

5. Food safety

Food safety has become one of consumers' top concerns. There have been disease outbreaks and food recall issues, such as BSE, Avian Flu, foot-and-mouth, E. coli 0157, etc. in the beef cattle and poultry industries (Canadian Food Inspection Agency, 2007, refer to table 3);. Food safety concerns have dramatically increased in the past decade following incident of contaminated meat products in the U.S. and Canada (Doyle and Erickson, 2006). Food contamination is the subject of public attention and may adversely affect consumer demand for the implicated food products. Food borne diseases are very costly to society in terms of losses in public health (de Jonge et al., 2008). There is a growing interest in determining the effects of food safety concerns on meat demand. Therefore, understanding the consumers' responses to food safety incidents is important to policy analysts and the meat industry.

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)

6. Advertising

Many studies have had a focus on the effects of advertising on consumers' meat consumption. Different types of advertising, including both generic and brand advertising, have been found 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 has been a popular tool used by food processors and retailers to increase market share of a specific branded product or to launch new products to increase category sales. Generic advertising has also been used as a marketing strategy to combat health concerns.

Economic problem

The Canadian meat industry faces many challenges and it is important to understand the links between various factors and the industry, factors such as industry consolidation, value-added product development, introduction of private label products, product substitution across meat

types, changing household demographics and food safety and health perception can all influence demand affecting profits and revenues of farmers, processors and retailers. From a policy perspective, all of these issues can affect consumer health and welfare, industry profitability and possibly result in the need for new or changed regulations or 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 developing a marketing strategy. Firms will also be interested in how consumers respond to new products, advertising and other sorts of promotion. These factors must be enunciated to understand how the Canadian meat industry can move forward to higher levels of customer satisfaction and value. The industry requires evolution to meet consumers' changing meat demand, especially for value-added meat products.

In this vein understanding consumer's value-added 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, household' attitudes and perceptions play a significant role in the store/brand and meat type choice behaviour, it is important to analyze how consumers determine their consumption decisions for the purchase of value-added meat products and brands. It is also important to understand, for policy formation how consumers choose between general grocery stores (including traditional retail cooperatives, such as Federated Co-operatives, etc) and multinational/ regional grocery chains and discount stores (such as Loblaws, METRO, Safeway, etc.). It is also necessary to find out how household spend their food dollar on meat products when their income increases.

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 new effective value added products and marketing strategies that respond to changing consumer needs, feeding into new product development; evaluating existing and potential policy opinion (such as, whether consumers respond as expected), which ultimately may increase the value of total sales.

Objectives

The overall objective of the study is to look at the structure of consumer value added meat purchasing behaviour (value added meat type choices, store choices as well as brand choices) in order to improve the understanding of recent food-at-home meat consumption patterns and discern new trends in value-added meat demand. Meat processors usually face two alternatives for branding policy: a 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 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, 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 make relative grocery store shopping traffic? How consumers' brand choice (national brands vs. private labels) may be 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 the new products and how to increase sales of value added meat products.

In particular, the study focuses on temporal and spatial patterns i.e. differences between similar households across geographic regions, as well as differences within individual households over time. 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 them on total expenditure and share of meat expenditure. Trends in meat demand overtime, changes in demand between different value-added meat products, choices between grocery stores and national/store brands, demand for value-added/processed meat and UPC coded products are all examined in this study. Information on marketing variables such as market shares in grocery store chain will also be presented. Moreover the study will focus on household store and brand choice analysis related to value-added meat purchasing.

Specifically the research objectives for the study are threefold:

1. Using household level purchase data over the period 2002-2007 in order 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 (fish, lamb, etc)
   - Quantify the impact of demographic and regional characteristic differences in meat consumption behaviour, and these differences in the behaviour across meat types.

2. Using household level meat purchase data from 2002-2007 and store level advertising data(1999-2006) in order 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. Use household level purchase data from 2002-2007 and Nielsen Media Measurement's advertising data(2000-2008) in order to:

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

Implications

The analysis presented can be used to help Canadian industry participants to develop economically sustainable marketing strategies by identifying and matching consumer segments with product offerings, e.g. identify health-concerned consumers and quantify their willingness to pay for value-added products with fundamental health attributes. It can also be used to investigate the impact on meat expenditures of information such as advertising coverage, and new product introduction and marketing strategies. For example, Alberta Agriculture and Rural Development, developed an Alberta Livestock and Meat Strategy for the period 2008-2013. The Alberta Livestock and Meat Strategy is in line with efforts throughout Canada to strengthen the national livestock industry. Provinces such as Alberta, Manitoba, Saskatchewan, British Columbia, Nova Scotia and Prince Edward Island have all provided recent support to the livestock and meat sectors (Alberta Agriculture and Rural Development, 2008). The analysis presented can be used in developing new value-added meat products and marketing strategies that maximize carcass value for all suppliers along the valued-added meat supply chain. Economic benefits can be generated for the meat industry in terms of increased efficiency and increased demand for value-added meat products produced in Alberta and Canada.

Literature Review And Methods

Introduction

In today's food industry, "value added" is a key term with various definitions. Value added is a very broad concept that encompasses many attributes such as seasoned, pre-cooked, healthy, convenience, prepackaged, etc. The term value-added can be interpreted in many ways (Kinsey et al., 1993; Gaquez-Abad and Sachez-Perez, 2009).

United States Department of Agriculture's (USDA, 2009) "definition of Value-Added 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, for example, organic carrots, free range chicken);
- Product segregation (the enhancement of value should be quantified to the extent possible by using a comparison with products marketed without segregation.), for example genetically modified corn and non-genetically modified corn grown on the same farm; or
- Agricultural commodities or products used as a source of farm or ranch based renewable energy.

Carrboro Farmers Markets, Inc (2007) defines value added 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% of the raw ingredients in a value added meat product." 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."

Definition of value-added meat products

One of the definitions for value added meat products is 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, eg modified atmosphere packaging"

The classification and definition of value added meat products in this study are according to the definition above and the availability of data from the sources used. "Value added" is defined as the level of value added processing in the meat products. There is great variety in the level of processing different meat products are subject to – in some cases products are processed to the point that they are ready to eat (luncheon meats) while others are merely seasoned or cut into small pieces ready for cooking. In this study an attempt is made to classify product by three different levels of processing, no other published study has examined meat by level of processing. Meat products are grouped into three categories: fresh, semi-processed and fully processed meat for four types of meat according to "meat cut" and "meat processed form" information provided by Nielsen Homescan™ database. 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 in the meat classification (Table 2.3). 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 fully processed meat category after combining both types of category information. UPC coded and random weighted meat products are all included in the sample data.

Table 2.1: Nielsen Homescan™ panel product processed form (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				

Table 2.2: Nielsen 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				

After classifying all meat products in the dataset into one of twelve categories the structure of the consumer choice problem for value added meat can be expressed as in Table 2.3. Consumers are in general assumed to determine how much spending they will entertain for meat and then to allocate that spending to different meats by type and by level of processing.

Table 2.3: Classification of value added meat in the study
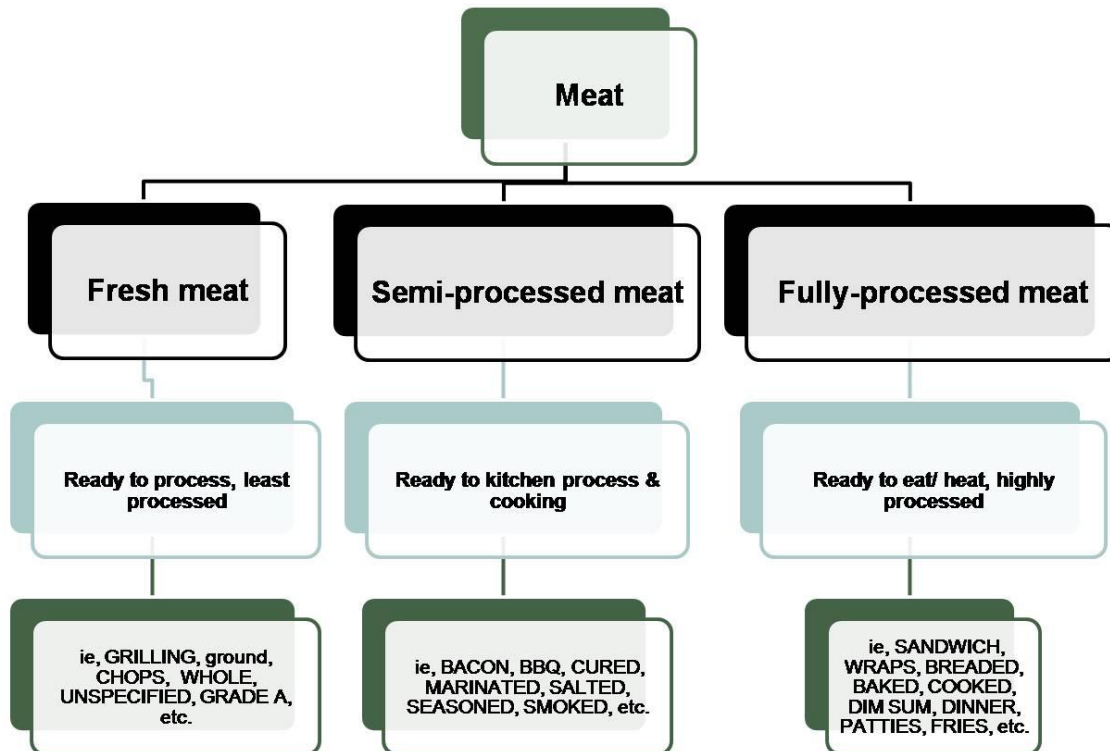
Overview of value added agricultural products demand

Understanding recent food-at-home meat consumption 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 value-added meat products. From a public health perspective understanding consumer meat purchasing behaviour can facilitate the design of health recommendations and regulations, the recent public health focus on sodium is an example of a public health concern that could change the ways meats are processed. Understand consumer's decision making can also help

to maximize meat manufacturers' revenues and minimize their costs. Meat manufacturers can influence consumer purchase decision through 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; Schnettler et al., 2009)

2. Product differentiation by investment in advertising (generic or branded 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, by amount of value adding (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 nationa company or coordinating with a grocery chain, brand loyalty), etc. (Connor and Peterson, 1992; Chintagunta, 1993b; 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)

Summary of Canadian meat demand studies

A number of relevant meat demand studies have been conducted in Canada since the early 1970's. The first Canadian meat demand study in the literature was published in 1961 (Yeh, 1961), the author used annual disappearance data for the period 1929 to 1958 to investigate

how consumers reacted to changes in the prices of beef and pork and in disposable income. Kulshreshtha and Wilson (1972) focused only on beef demand (disappearance) in their study. Tryfos and Tryphonopoulos (1973) used annual disappearance data for the period 1954 to 1970 for beef, pork, chicken, lamb, veal and turkey demand analysis. Hassan and Katz (1975) applied Seemingly Unrelated Regression (SUR) analysis to estimate price and income elasticities of demand (disappearance) for beef, pork, lamb, veal, chicken and turkey. Hassan and Johnson (1979) applied Box-Cox transformations to select from a variety of functional forms (Linear, Double log, semi-log, log-inverse and general), and showed that that different specifications can lead to different meat demand elasticity results. Hassan and Johnson (1983) applied different estimation procedures (OLS, GLS and SUR) with seasonality hypotheses for the demand for beef, pork, veal, chicken and turkey. Young (1987) and Atkins et al. (1989) attempted to analyze the 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 (again using disappearance data). However Atkins et al. (1989) found a structural break in beef demand.

In many Canadian meat demand studies, the AIDS model, explaining expenditure shares in a system of equations, have been used since 1991. However the importance of functional form selection in producing meaningful economic characteristics of consumer behaviour cannot be underestimasted. 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 that demand study. Chalfant, Grey and White (1991) analysed meat demand using an AIDS demand system for beef, pork, poultry, and fish. They found a small positive cross price elasticity (economic substitution) between fish and pork. In their study the meat expenditure elasticity is positive for chicken and fish, but negative for beef and pork, suggesting that beef demand will decline as an individual's expenditure on meat increases. Chen and Veeman (1991) used a dynamic AIDS model of Canadian meat demand and compared it with 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 caused by increasing health concerns regarding diets and growth of fast food outlets. Reynolds and Goddard (1991) also focused on the structural change and analyzed demand for beef, pork and chicken. Their results showed that the structure of Canadian meat demand has changed gradually over the period 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, in favour of chicken consumption.

Cozzarin and Goddard (1992) first included advertising as a factor in meat demand. They compared two types of models the Translog and AIDS demand systems to analyse disappearance of 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 demand. 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 shows that the gradual transition AIDS model is preferred over the gradual-transition Rotterdam model for Canadian meat consumption. In a departure from the traditional approach of examining aggregate disappearance data on meat, Salvanes and DeVoretz (1997) focused on the specification of Canadian household demand for fish and meat products. The authors applied tests for separability by estimating different demand systems over different processed levels for fish and meat. The test indicates that fish is not weakly separable from the two other aggregated categories. And at an aggregated level Canadian fish demand cannot be modeled from meat.

Lerohl et al.(2004) and Lomeli (2005) included media influences on changes in consumption of meat products in Canada using both time series (disappearance) and cross sectional (household Family Food Expenditure Survey) data. Results found that pork-safety issues had

negative and significant own consumption effects. and positive cross-effects for beef. Pork generic advertising had own positive effects, while pork consumption was negatively affected by chicken generic advertising. Both beef brand and beef fast food restaurant advertising increased beef consumption. Lambert et al. (2006) analysed regional differences in meat and fish demand across Canada. A QUAIDS demand system was applied in the study using Canadian household food expenditure surveys conducted in 1992 and 1996. The authors found that various variables including prices, age, ethnicity and real total meat and fish expenditure affected the probabilities of purchase. Maynard et al.(2008) applied a double-hurdle count data model to test frequency of BSE media coverage which affected a household purchasing a beef entre in a restaurant. Anders and Moeser (2008) applied weekly retail and household scanner data to estimate consumer demand for organic and conventional fresh beef products in the Canadian retail market. The results indicated that "organic beef was highly dependent on price and expenditures, whereas demand for conventional beef was mostly driven by income, habits and 'typical' Canadian seasonal beef consumption patterns."

Table 2.4 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 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 1968 to 1986	Found a structural break in beef demand.
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 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 form 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.
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	Nielsen 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

Hierarchy of consumer purchase decision making in the study

The focus of this study is on how meat consumers make their decisions to purchase value added 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 (i.e. before store, before type, before brands).

Wrigley (1988) finds the sequence of shopping decisions that "consumers choose a store knowing that they can obtain a desired brand there, then branding, promotion and advertising support are that much more important." Brucks (1988) suggested a sequence of choices as first choose stores and then make the brand choices. Guadagni and Little (1998) concluded that a decision tree for a customer on a shopping trip that " the customer may be viewed as deciding sequentially when to buy and then what to buy but with interaction between the

decisions". Bucklin and Lattin (1986) and Guadagni and Little (1987) both regard purchasing as a sequential process: choose product category at the first stage, then choose a brand. Krish- namurthi and Raj (1988) view brand choice and purchase quantity as related decisions and model them as such. Gupta (1988) models brand choice (what to buy), purchase quantity (how much to purchase) and interpurchase time (when to shop) decisions independently. Kahn and Schmittlein (1989) consider the hierarchical purchase process as that consumers must first decide to enter the store to shop before choosing brands.

Chiang (1991) views the decision process as "whether to buy," "what to buy" and "how much to buy". Chintagunta (1993a) concluded that household purchase behavior contains three components: purchase incidence, brand choice and purchase quantity. Wilkie (1994) described consumer decision process of three stages: sensing, selecting, and interpreting. Piedra et al. (1995) concluded that "nearly two thirds of U.S. consumers purchase at least three different types of meat per week. Some meat choices are made prior to shopping, others are made after in-store visual inspection of cuts and prices." Kamakura et al. (1996) conclude that "some consumers may first choose what brand to buy, and then choose product form, size, or flavor. Others may first choose the flavour in a shopping occasion, and then choose among the brands offering that flavour."

Degeratu et al.(2000) divided the choice decision into a two-stage choice model in which customers first choose the store type in which they shop and then make brand choices. Sood et al. (2004) and Chernev (2006) views choice as "a hierarchical decision process as two different stages (instead of two independent choices): first make an assortment selection and then selectan option from that assortment." Hui et al (2009) divide a shopping path into three stages of visit, shop, and buy decisions. They conclude that factors of time pressure, licensing, and social influence of other shoppers influence the consumer in-store decision making process. Ailawadi et al. (2008) private label have an influence on consumers' expenditure share of 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 want. In this step, oil price is a function of quantity and production patterns. Then the consumers decide which brand to buy (brand choice behavior). Juhl et al., 2006; Esbjerg and Bech-Larsen, 2009)This is at least the case in the short run, as consumers typically will not visit another store if they cannot find their preferred brand in the store they have chosen. Some studies (Juhl et al., 2006; Esbjerg and Bech-Larsen, 2009) indicate that consumers choose stores before they choose brands, then manufacturers should focus on the assortments of the retail chains with the best locations.

Based on the previous hierarchy of choice studies, it is reasonable to assume that when consumers allocate budget shares within the meat category, weak separability of consumer preferences can be invoked to examine purely the hierarchical budgeting processes for meat in the shopping decision (Montgomery, 2002). The possible decision flows for the meat purchase decision are among: 1. Stores choice; 2. Meat choice by types (fresh, semi and fully processed meat); 3. Meat choice by brands (National brands vs. Private labels). The following three examples of decision flows are among many possible combinations that could be postulated, consumers could also use 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.
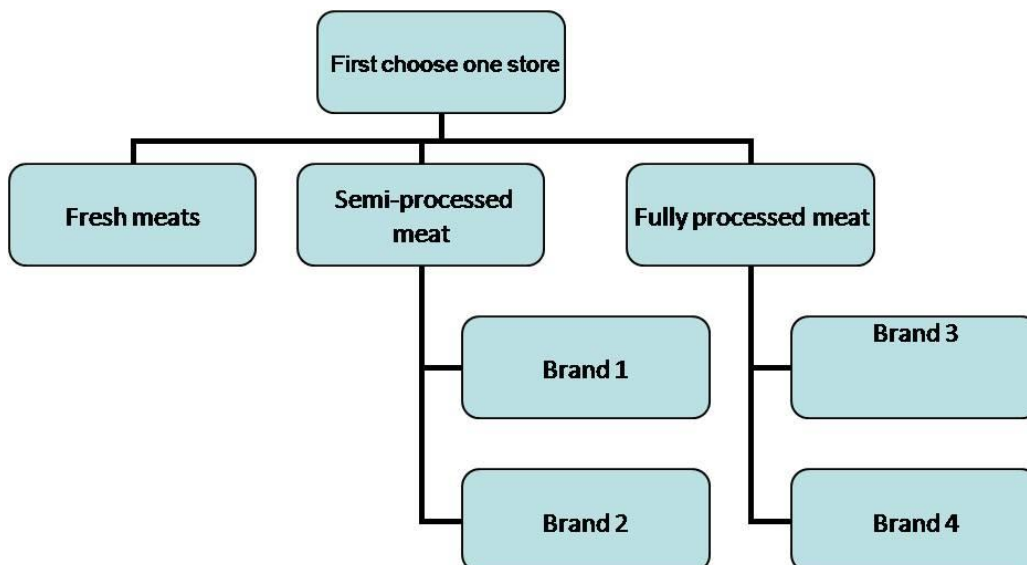
Assumption 2: An alternative process could be: consumers first make the decision of what types of meat they need to purchase, then they choose related brands, finally they decide where to buy the certain meat products.

```
Meat products
    ├── Fresh meats
    ├── Semi-processed meat
    │       ├── Brand 1
    │       └── Brand 2
    └── Fully processed meat
            ├── Brand 1
            │       ├── Store 1
            │       └── Store 2
            └── Brand 2
                    ├── Store 1
                    └── Store 2
```
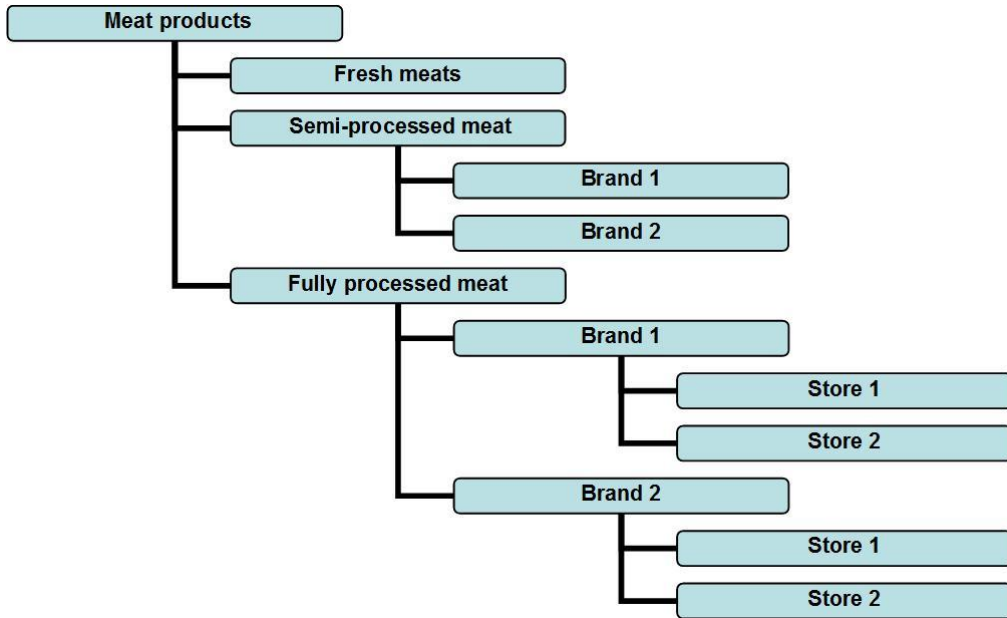
Assumption 3: Or consumers could first make the decision of what types of meat they need to purchase, then they choose where to shop, finally they make the brand decision for the certain meat products.

```
Meat products
    ├── Fresh meats
    ├── Semi-processed meat
    └── Fully processed meat
            ├── Store 1
            │       ├── Brand 1
            │       └── Brand 2
            └── Store 2
                    ├── Brand 1
                    └── Brand 2
```
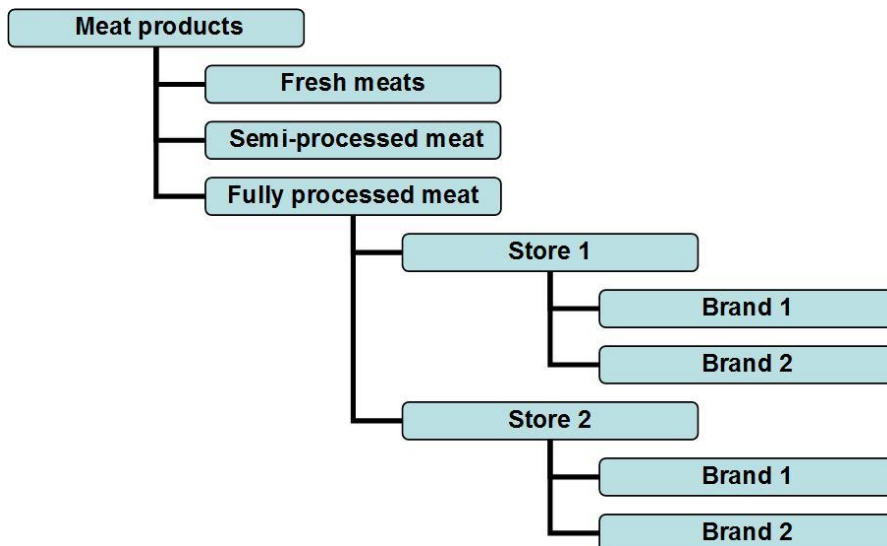
Model structure and econometric method

Based on the comprehensive review of the issues related to meat demand analysis in the previous section, many different techniques are employed in this study to explain consumers' choice about meat types, meat brands and where to shop. Different functional form and model methodologies are applied to address the impact of prices and other economic determinants (elasticities) by demographic and regional characteristics in meat consumption behaviour, and these differences in the behaviour across meat types.

In this study panel data, data on households purchasing behaviour across time, will be used. Panel data analysis can provide a large number of data points, hence improving the efficiency of econometric estimates. Hsiao (2003) 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 can provide more variability, more efficiency and more degree of freedom. Panel analysis is also able to identify and measure effects that are simply not detectable in pure cross section or pure time series data, because panel data have double subscripts on their variables (Baltagi, 2008), ie

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

Panel data sets are two-dimensional, where i represents households, individuals or countries (cross section dimension) and t denotes time points (time series dimension). α is a scalar, while β is K * 1 and $X_{it}^{'}$ is the it th observation on a vector of k nonstochastic regressors.

Different assumptions can be made on the precise behavioural structure using panel data. Two main models are the one-way fixed effects regressions and random effects regressions (Baltagi, 2008)

The fixed effects model is denoted as

$$y_{it} = \alpha + \beta'X_{it} + u_{it},$$

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

where the μi are assumed to be elements of fixed parameters and they are fixed over time, this is called the fixed-effects model. Essentially variation across individuals is defined as a fixed effect difference between individuals.

The random effects model assumes in addition that the error terms for individuals are defined as random disturbances drawn from distributions with the following specifications :

$$\mu_i \sim IID(0, \sigma_\mu^2)$$

and

$$\upsilon_{it} \sim IID(0, \sigma_v^2)$$

The two error components μ_i and υ_{it} are independent from each other (Baltagi, 2008).

Usually household samples vary in a random manner, so random models are appropriate specifications in dealing with household panel data (Baltagi, 2008). Thus, a random effects model is used in this study.

The general structure of panel data is based on a matrix of N units and T periods. When the number of time observations is the same as each individual observation unit (N units and T periods), the panel is called 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 then the panel is called an unbalanced panel (Baltagi, 2008). A balanced panel approach is used in the study.

In this study, store choice, brand preferences and household demographic characteristics are all assumed to affect the consumers' demand. The decision making process follows a hierarchical process. Due to the nature of our household-level panel data, with some zero-consumption problems and based on previous related demand studies, a Working-Leser demand system is used in the analysis.

The Working-Leser model was originally discussed by Working (1943) and Leser (1963). Working (1943) first applied the log-linear budget share specification to the model and Leser (1963) found that this functional form fit better than some other alternatives. Deaton and Muellbauer (1980a) provide more detailed information on this functional form. Basic Engel functions represent the relationship between consumption and consumer's income level. In addition, household consumption is also affected by demographic and socio-economic variables. In the Working-Leser model, each expenditure share is represented by a linear function of the log of prices and of the total expenditure and household demographic variables. The Working-Leser food demand function can be expressed as:

$$\omega_i = a_0 + a_i * \log x + \sum_j \beta ij * \ln(p_j) + \sum_k \tau ij H_k + \varepsilon_{it}$$

where *(i,j)* represents given meat products; *wi* is the expenditure share of a particular meat *i*; *pj* is the price of meat *j*; and *X* is the total expenditure of all types of meat included in the model. *Hk* represents the household demographic variables.

The expenditure elasticity formulae for the Working-Leser model (ei) can be shown as:

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

The uncompensated own (j =i) and cross (j ≠i) price elasticities (eij) are defined as follows:

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

where δ_{ij} 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. In this study, expenditure, own-price and cross-price elasticities are evaluated at sample means.

Demographic Data and Descriptive Statistics

Introduction

This research project mainly contains three sections of analysis: consumers' meat demand analysis by level of processing, consumers' store choice analysis in meat purchasing, and analysis of 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 Nielsen Company Homescan™ panel data for calendar years 2002 through 2007. These data are taken from a sample of households that are representative for the Canadian population (as shown in table 3.1) by year. Each household was provided with a scanner machine by Nielsen in which they could scan and record all items purchased in different grocery stores in a given period, as well as demographic information about the household.

Nielsen Homescan™ panel data is a unique dataset that consists, in this case, of all meat purchases by 16,515 Canadian households from 2002 to 2007, not necessarily all households are present in the sample for each year. Meat 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, household size and education, presence of children, etc.. Since not all participant households stayed in the panel in all six years from 2002 to 2007, Table 3.2 shows the proportion of households that stayed in the panel for each year. Some of the households dropped out of the panel and other households participated in the panel for the subsequent year. 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 with missing information on important variables and 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, at a monthly level. Meat and store expenditure data are expressed in terms of Canadian dollars.

Table 3.1: Comparing Sample Balanced Data with 2006 Census Profile of Canada

	Nielsen 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 Nielsen Homescan™ panel data 2002-2007

Table: 3.2 The proportion of households who participated in the panel from 2002-07

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

Source: Nielsen Homescan™ panel data 2002-2007

Socioeconomics and demographic information and definitions

Nielsen Homescan™ panel data has detailed information on household socioeconomic and demographic characteristics for each of the panellist. The sample data used in all three studies in the project focus 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 project include: household size, household income, household head age, education, and presence of children, language, urbanization, and province. In this section, the definition of household demographic variables used in the empirical analyses are provided. In addition, descriptive statistics associated with the study sample comparing households in the provinces of Ontario and Alberta are presented.

Income

Household income levels are recorded as a categorical variable (income falls within a range such $25,000 to $34,000) in the Nielsen Homescan™ panel data. Mid-points are used to approximate a continuous income measure. Table 3.3 and 3.4 present the income classes and mid-point values for the sample data and comparable Canadian Census data, for 2006. The

frequency distribution by year implies that the study sample data is roughly representative of income classes in the Census data.

Table 3.3 The income classes and mid-point value for the sample data for Ontario

Income class (CAD$)	Midpoints	YEAR	Nielsen 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 Nielsen Homescan™ panel data 2002-2007

Table 3.4 The income classes and mid-point value for the sample data for Alberta

Income class (CAD$)	Midpoints	YEAR	Nielsen 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 Nielsen Homescan™ panel data 2002-2007

As appears in Table 3.3, in Ontario the aggregate frequency of households falling into income classes: less than $20,000, $20,000-$29,999 and $30,000-$39,999 are higher in the Nielsen panel data than in Census 2006. This difference is compensated for with a lower frequency of income class of $50,000-$69,999 and $70,000+ in Nielsen Homescan™ panel than in Census 2006. The same distribution also appears in Alberta. The aggregate frequency of households falling into income classes in Alberta: less than $20,000, $20,000-$29,999 and $30,000-$39,999 are higher in Nielsen Homescan™ panel data than in Census 2006, and $50,000-$69,999 and $70,000+ income class have a lower frequency in Nielsen Homescan™ panel data than in the Census 2006 data. The difference indicates that lower income households participated more in the data collection activities than households in the higher income class. When compared over time, it appears that for both Alberta and Ontario, the proportion of households falling into higher income classes (such as more than $70,000) is increasing and the proportion falling into lower income classes (such as less than $20,000) is decreasing. The increase in the percentage of households with higher incomes is observed over the study period, implying that households remaining in the panel over the period 2002-2007 exhibited increasing incomes.

Household head age

Household head age is recorded as a categorical variable in the Nielsen panel data.. The same mid-point method is used to approximate household head age levels as a continuous measure. Table 3.5 and 3.6 present the household head age classes and mid-point values for the sample data. As appears in both tables 1 and 2, the aggregate frequency of younger household age classes: 18-34 are much lower in Nielsen panel sample data than in the Census 2006 data. However the percentage of older household heads in the classes: 45-54, 55-64, 65+ are higher in the Nielsen Homescan™ panel data. This implies that households with younger heads do not participate in the panel at the same rate as households with middle aged - or older heads do. Both tables also show that the proportion of households with older heads

is increasing over the time frame of this study, the households that stayed in the panel tended to have older heads.

Table 3.5 the household head age classes and mid-point value for the sample data of Ontario

HH age class	Midpoints	YEAR	Nielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
18-34	26	Count	42	42	16	16	16	6	138	19.0%	19.0%
		HH%	4.1%	4.1%	1.5%	1.5%	1.5%	.6%	2.2%		
35-44	39.5	Count	230	230	204	189	189	146	1188	15.0%	16.0%
		HH%	22.2%	22.2%	19.7%	18.2%	18.2%	14.1%	19.1%		
45-54	49.5	Count	268	268	271	265	265	265	1602	16.0%	15.0%
		HH%	25.9%	25.9%	26.2%	25.6%	25.6%	25.6%	25.8%		
55-64	59.5	Count	233	233	226	233	233	227	1385	12.0%	11.0%
		HH%	22.5%	22.5%	21.8%	22.5%	22.5%	21.9%	22.3%		
65+	69.5	Count	263	263	319	333	333	392	1903	14.0%	14.0%
		HH%	25.4%	25.4%	30.8%	32.1%	32.1%	37.8%	30.6%		
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: Source: Statistics Canada - 2006 Census. Catalogue Number 97-551-XCB2006012.and

Nielsen Homescan™ panel data 2002-2007

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

HH age class	Midpoints	YEAR	Nielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
18-34	26	Count	46	46	25	16	16	8	157	19.0%	22.0%
		HH%	9.1%	9.1%	4.9%	3.1%	3.1%	1.6%	5.2%		
35-44	39.5	Count	108	108	99	87	87	73	562	15.0%	15.0%
		HH%	21.3%	21.3%	19.5%	17.1%	17.1%	14.4%	18.4%		
45-54	49.5	Count	150	150	155	158	158	151	922	16.0%	16.0%
		HH%	29.5%	29.5%	30.5%	31.1%	31.1%	29.7%	30.2%		
55-64	59.5	Count	99	99	111	120	120	129	678	12.0%	10.0%
		HH%	19.5%	19.5%	21.9%	23.6%	23.6%	25.4%	22.2%		
65+	69.5	Count	105	105	118	127	127	147	729	14.0%	11.0%
		HH%	20.7%	20.7%	23.2%	25.0%	25.0%	28.9%	23.9%		
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: Source: Statistics Canada - 2006 Census. Catalogue Number 97-551-XCB2006012.and

Nielsen Homescan™ panel data 2002-2007

Household size

Household size variable measures the number of members of the household. The Nielsen panel records the household size in five groups. Household size equal to one, means there is only a single member of 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. Table 3.7 and 3.8 show the proportion of households with different household sizes for the sample data and the comparable Canadian Census data for 2006.

Table 3.7 Household sizes for the sample data of Ontario and Census 2006

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

Table 3.8 Household sizes for the sample data of Alberta and Census 2006

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

Household education

The household education variable indicates the level of the household head's education achieved. The Nielsen panel records the household education in six levels: no high school graduation; high school graduate; some college or technical school; college or technical school graduate; some university; university graduate. The six categories of education level are reduced to two groups: no high school graduation and otherwise. The education dummy variable (HHEDU1) is then created with a value of one if the household has high school or higher education and zero otherwise. The descriptive statistics for the household education level are listed below in tables 3.9 and 3.10.

Table 3.9 Household head education for the sample data of Ontario and Census 2006

Education levels	Dummy	YEAR	Nielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
No high school education	HHEDU1=0	Count	151	151	145	145	145	131	868	24.0%	22.0%
		HH%	14.6%	14.6%	14.0%	14.0%	14.0%	12.6%	14.0%		
Otherwise	HHEDU1=1	Count	885	885	891	891	891	905	5348	77.0%	78.0%
		HH%	85.4%	85.4%	86.0%	86.0%	86.0%	87.4%	86.0%		
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 Nielsen Homescan™ panel data 2002-2007

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

Education levels	Dummy	YEAR	Nielsen Homescan panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
No high school education	HHEDU1=0	Count	73	73	67	63	63	57	396	24.0%	23.0%
		HH%	14.4%	14.4%	13.2%	12.4%	12.4%	11.2%	13.0%		
Otherwise	HHEDU1=1	Count	435	435	441	445	445	451	2652	77.0%	76.0%
		HH%	85.6%	85.6%	86.8%	87.6%	87.6%	88.8%	87.0%		
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 Nielsen Homescan™ panel data 2002-2007

Presence of children

The Nielsen Homescan™ panel records the presence and the age of children information under 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, we group and create two dummy variables to define the presence of children information. The dummy variable (Child1) is created with a value of one if the household has the presence of children (aged 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 do not have children under the age of 18. An increase of the percentage of households without children can be observed in both Ontario and Alberta over the study period, implying the households had older children to start who left the home during the sample.

Table 3.11 Household presence of children for the sample data of Ontario and Census 2006

Children	Dummy	YEAR	Nielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
No children	CHILD1=0	Count	781	781	809	807	807	844	4829	77.0%	75.0%
		HH%	75.4%	75.4%	78.1%	77.9%	77.9%	81.5%	77.7%		
Have children	CHILD1=1	Count	255	255	227	229	229	192	1387	23.0%	25.0%
		HH%	24.6%	24.6%	21.9%	22.1%	22.1%	18.5%	22.3%		
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 Nielsen Homescan™ panel data 2002-2007

Table 3.12 Household presence of children for the sample data of Alberta and Census 2006

Children	Dummy	YEAR	Nielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
No children	CHILD1=0	Count	380	380	398	402	402	409	2371	77.0%	67.0%
		HH%	74.8%	74.8%	78.3%	79.1%	79.1%	80.5%	77.8%		
Have children	CHILD1=1	Count	128	128	110	106	106	99	677	23.0%	33.0%
		HH%	25.2%	25.2%	21.7%	20.9%	20.9%	19.5%	22.2%		
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 Nielsen Homescan™ panel data 2002-2007

Urban and Rural

The location where household reside are 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) have 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	Dummy	YEAR	Nielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Ontario
Rural	Urban=0	Count	334	333	322	323	324	324	1960	19.0%	15.0%
		HH%	32.2%	32.1%	31.1%	31.2%	31.3%	31.3%	31.5%		
Urban	Urban=1	Count	702	703	714	713	712	712	4256	81.0%	85.0%
		HH%	67.8%	67.9%	68.9%	68.8%	68.7%	68.7%	68.5%		
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 Nielsen Homescan™ panel data 2002-2007

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

Urbanization	Dummy	YEAR	Nielsen Homescan™ panel data 2002-2007							Census, 2006	
			2002	2003	2004	2005	2006	2007	Total	Canada	Alberta
Rural	Urban=0	Count	159	160	160	161	160	160	960	19.0%	17.0%
		HH%	31.3%	31.5%	31.5%	31.7%	31.5%	31.5%	31.5%		
Urban	Urban=1	Count	349	348	348	347	348	348	2088	81.0%	83.0%
		HH%	68.7%	68.5%	68.5%	68.3%	68.5%	68.5%	68.5%		
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 Nielsen 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 data for 2006. The sample data are a balanced panel which covers households which stayed in the panel over the study period from 2002 and 2007. So it is observed that households included tended to have older heads and have higher education and income levels than the Canadian Census data. Behavioural models reported in this study will be more representative for the better educated, more urban, higher income and older households than for the 2006 Canadian population as a whole. The next section will provide more data descriptive statistics on household meat and store expenditures.

Canadian Meat Demand Analysis By Level of Processing

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 type categories: beef, pork, poultry and others (fish, lamb, etc.). The analysis aims to quantify the impact of price, advertising, demographic and regional characteristic differences on meat consumption behaviour, and differences in the behaviour across meat types. In this section, the data setup for the analysis followed by the data descriptive statistics are provided. Then the explanation of model specification and econometric methods are presented. The model results and summary are finally provided in the section.

Data setup and descriptive statistics

Nielsen Homescan™ data is used in this analysis, the data contains all individual panellist's meat purchase information, by size, by product processed form, by brand, and by meat type. The panel data also includes the household demographic data, including age of household head, presence of children, income, education, urban and rural residence information,as described above. The meat demand analysis focuses on the meat products purchased by household in the provinces of Ontario and Alberta over the time period 2002 to 2007. In total, 1036 households in Ontario and 508 households in Alberta are observed in the balanced panels. Value added meat products are grouped into the twelve meat categories according to their "PRTYP" (meat processed type table) and "PRFRM" (meat processed from table) information recorded by Nielsen Homescan™ data (as discussed in the first section). Twelve choice alternatives in this analysis were identified: (1) fresh pork, beef, poultry and other meats; (2) semi-processed pork, beef, poultry and other meats; (3) fully processed pork, beef, poultry and other meats. These product purchases across a year were aggregated into annual expenditures, on the twelve products, for each household.

1 .Total expenditure on value added meat

Aggregate annual expenditures on the meat products for the period 2002 to 2007 are described in this section. In Table 4.1 and 4.2 below, aggregate market (expenditure) shares for each of the twelve meat categories in Ontario and Alberta are reported.

Table 4.1. Market share for each meat category in Ontario.

	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: Nielsen Homescan™ Panel, Ontario 2002 to 2007

Table 4.2. Market share for each meat category in Alberta.

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: Nielsen Homescan™ Panel, Alberta 2002 to 2007

Error! Reference source not found. In Tables 4.3 and 4.4 report the average spending per household per year for each meat category from 2002 to 2007 is presented. Average annual household total meat expenditure increased from $336 to $398 in Ontario and $382 to $406 in Alberta.

Table 4.3. Annual average expenditure., dollars

Data	2002	2003	2004	2005	2006	2007
Twelve meat categories						
Fresh pork	44.5	48.6	45.2	48.8	46.8	45.8
Fresh beef	107.0	110.3	121.0	115.8	114.6	115.9
Fresh poultry	80.9	89.7	97.7	99.7	97.8	99.3
Fresh others	10.8	18.0	22.5	22.3	18.8	19.4
Semi processed pork	15.0	16.9	21.6	23.8	20.4	22.2
Semi processed beef	1.8	2.4	3.2	4.6	4.7	5.7
Semi processed poultry	4.8	6.6	8.8	8.2	8.2	9.6
Semi processed others	9.5	9.2	8.3	6.9	6.3	6.5
Fully processed pork	8.8	9.5	14.8	16.1	17.0	15.4
Fully processed beef	2.4	2.2	2.6	2.4	2.2	2.0
Fully processed poultry	28.2	28.7	29.5	26.2	23.8	22.6
Fully processed others	22.3	25.2	28.6	33.4	36.6	34.5
Total	336.1	367.3	403.7	408.1	397.4	398.9
By value added levels						
Fresh meat total	243.2	266.6	286.4	286.6	278.1	280.4
Semi processed meat total	31.2	35.0	41.9	43.5	39.7	44.0
Fully processed meat total	61.7	65.7	75.4	78.0	79.6	74.5
By meat types						
Pork total	68.4	75.0	81.6	88.7	84.3	83.5
Beef total	111.1	114.9	126.8	122.7	121.5	123.6
Poultry total	114.0	125.1	136.0	134.1	129.8	131.5
Others total	42.6	52.3	59.4	62.6	61.8	60.4

Source: Nielsen Homescan™ Panel, Ontario 2002 to 2007

For 2007, on average, household total meat expenditure averaged $398 in Ontario. Fresh meat consumption is the large market share in meat consumption, in which fresh beef has the single largest share.

Table 2.4 Alberta Annual average expenditure, dollars.

Data	2002	2003	2004	2005	2006	2007
Twelve meat categories						
Fresh pork	62.4	72.7	69.7	72.4	59.6	57.3
Fresh beef	140.7	152.4	131.1	131.7	134.4	132.3
Fresh poultry	90.3	95.8	102.6	102.8	103.0	99.9
Fresh others	12.1	16.5	20.2	18.7	13.9	15.1
Semi processed pork	4.2	6.2	11.3	14.4	8.2	7.4
Semi processed beef	3.6	4.2	4.6	4.2	3.4	3.6
Semi processed poultry	2.9	2.9	3.1	4.0	6.2	7.4
Semi processed others	7.2	5.9	6.8	6.7	5.5	4.5
Fully processed pork	13.6	17.0	22.7	23.4	21.4	21.0
Fully processed beef	2.5	2.4	2.2	3.1	3.8	3.4
Fully processed poultry	24.7	23.1	24.3	24.3	21.7	23.3
Fully processed others	18.4	22.2	33.0	31.2	29.1	30.9
Total	382.7	421.3	431.7	436.8	410.3	406.2
By value added levels						
Fresh meat total	305.5	337.5	323.7	325.6	310.9	304.5
Semi processed meat total	18.0	19.2	25.8	29.3	23.3	23.0
Fully processed meat total	59.2	64.6	82.2	82.0	76.1	78.6
By meat types						
Pork total	80.1	95.9	103.7	110.2	89.2	85.7
Beef total	146.8	159.0	137.9	139.0	141.6	139.3
Poultry total	118.0	121.8	130.1	131.1	131.0	130.6
Others total	37.7	44.7	60.1	56.6	48.5	50.5

Source: Nielsen Homescan™ Panel, Alberta 2002 to 2007

For 2007, on average, household total meat expenditure averaged $406 in Alberta. Fresh meat consumption is also the large market share category in meat consumption.

In Tables 4.5 and 4.6, the coefficients of variation for expenditure on each of the meat categories are reported. The coefficient of variation is a normalized measure of the dispersion of sample data. It is calculated as the ratio of the standard deviation to the mean. The coefficient of variation can provide a comparison across market segments when the means across segments vary. The higher the level of the coefficient of variation, the greater is the degree of variability in the data.

Table 4.5 Coefficients of variation of household purchases in Ontario.

	2002	2003	2004	2005	2006	2007
Fresh pork	1.3	1.4	1.3	1.3	1.3	1.2
Fresh beef	1.2	1.2	1.2	1.2	1.3	1.3
Fresh poultry	1.1	1.0	1.0	1.0	1.2	1.1
Fresh others	2.5	1.9	1.8	2.0	2.5	2.5
Semi processed pork	2.0	1.8	1.9	1.6	1.6	1.4
Semi processed beef	3.6	3.2	2.6	2.5	2.8	2.6
Semi processed poultry	2.5	2.6	2.1	2.2	2.2	2.0
Semi processed others	1.7	1.8	1.9	1.9	2.1	2.3
Fully processed pork	1.8	1.8	1.5	1.5	1.5	1.5
Fully processed beef	3.7	3.8	3.5	3.3	3.5	3.3
Fully processed poultry	1.6	1.8	1.7	1.9	1.8	2.4
Fully processed others	1.7	1.6	1.6	1.3	1.4	1.5
Pork total	1.1	1.2	1.1	1.1	1.0	1.0
Beef total	1.2	1.2	1.2	1.2	1.2	1.3
Poultry total	0.9	0.9	0.9	0.9	1.0	1.0
Others total	1.3	1.2	1.2	1.2	1.3	1.3
Fresh meat total	1.0	0.9	0.9	0.9	1.0	1.0
Semi processed meat total	1.4	1.3	1.3	1.2	1.2	1.1
Fully processed meat total	1.2	1.2	1.1	1.1	1.0	1.2
Total	0.9	0.8	0.8	0.8	0.9	0.9

Source: Nielsen Homescan™ Panel, Ontario 2002 to 2007

Table 4.6. Coefficients of variation of household purchases in Alberta.

	2002	2003	2004	2005	2006	2007
Fresh pork	1.2	1.2	1.3	1.3	1.3	1.3
Fresh beef	1.1	1.1	1.1	1.1	1.1	1.2
Fresh poultry	1.0	1.0	1.0	1.0	1.0	1.0
Fresh others	2.3	1.8	2.1	1.7	1.8	1.7
Semi processed pork	3.0	2.4	2.1	2.6	2.0	2.3
Semi processed beef	2.6	2.4	2.3	2.9	3.2	3.1
Semi processed poultry	2.8	2.6	2.9	2.5	2.2	2.3
Semi processed others	1.7	1.8	2.0	2.2	2.3	2.4
Fully processed pork	1.5	1.3	1.2	1.2	1.4	1.4
Fully processed beef	3.3	3.0	3.2	3.6	3.0	2.9
Fully processed poultry	1.7	1.7	1.8	1.9	1.8	1.9
Fully processed others	1.5	1.4	1.3	1.3	1.4	1.3
Pork total	1.1	1.1	1.1	1.1	1.1	1.1
Beef total	1.1	1.1	1.1	1.1	1.1	1.1
Poultry total	0.9	0.9	0.9	0.9	0.9	0.9
Others total	1.2	1.2	1.2	1.2	1.1	1.1
Fresh meat total	0.9	0.9	0.9	0.9	0.9	0.9
Semi processed meat total	1.3	1.4	1.4	1.6	1.4	1.6
Fully processed meat total	1.0	0.9	0.9	0.9	0.9	0.9
Total	0.8	0.8	0.8	0.8	0.8	0.8

Source: Nielsen Homescan™ Panel, Alberta 2002 to 2007

The coefficients of variation for most of the meat categories is greater than one in Ontario and Alberta, except for the poultry total and fresh meat total categories. It means the standard deviation is greater than the mean in the aforementioned categories and using the mean per household expenditure on each meat category to represent the population could become problematic, as spending patterns vary widely within the population. Hence, a segmentation approach (segment consumers into groups) is applied in purchasing patterns among households across the years in next section.

2. Household food 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 section are the household demographic variables. The value added meat expenditure patterns are shown in the following tables.

In Tables 4.7-4.14, the households are grouped into seven categories based on expenditure levels on all meat categories. The seven expenditure levels are 0 dollar (no consumption), less than 25 dollars, 25 to 50 dollars, 51 to 100 dollars, 101 to 300 dollars, 301 to 500 dollars, and more than 500 dollars. The aggregate data for 2002 to 2007(six years) are presented in tables below.

Table 4.7 Meat expenditure by fresh meat category in Ontario from 2002-2007
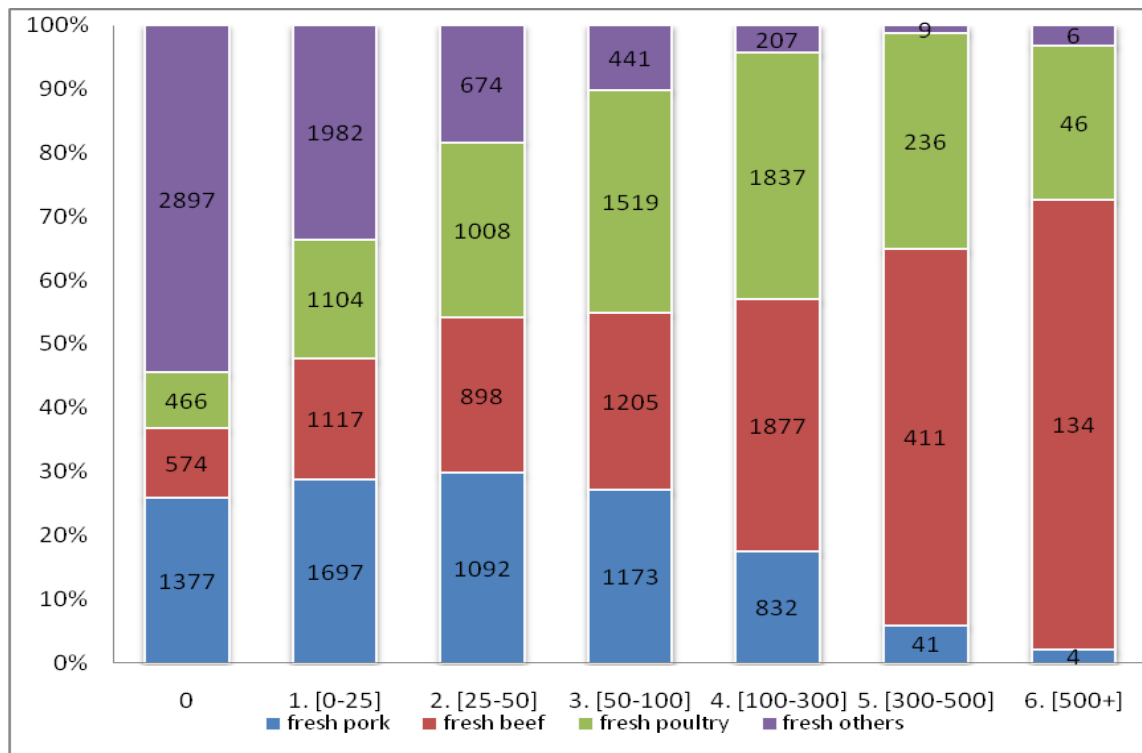
Table 4.8 Meat expenditure by fresh meat category in Alberta from 2002-2007
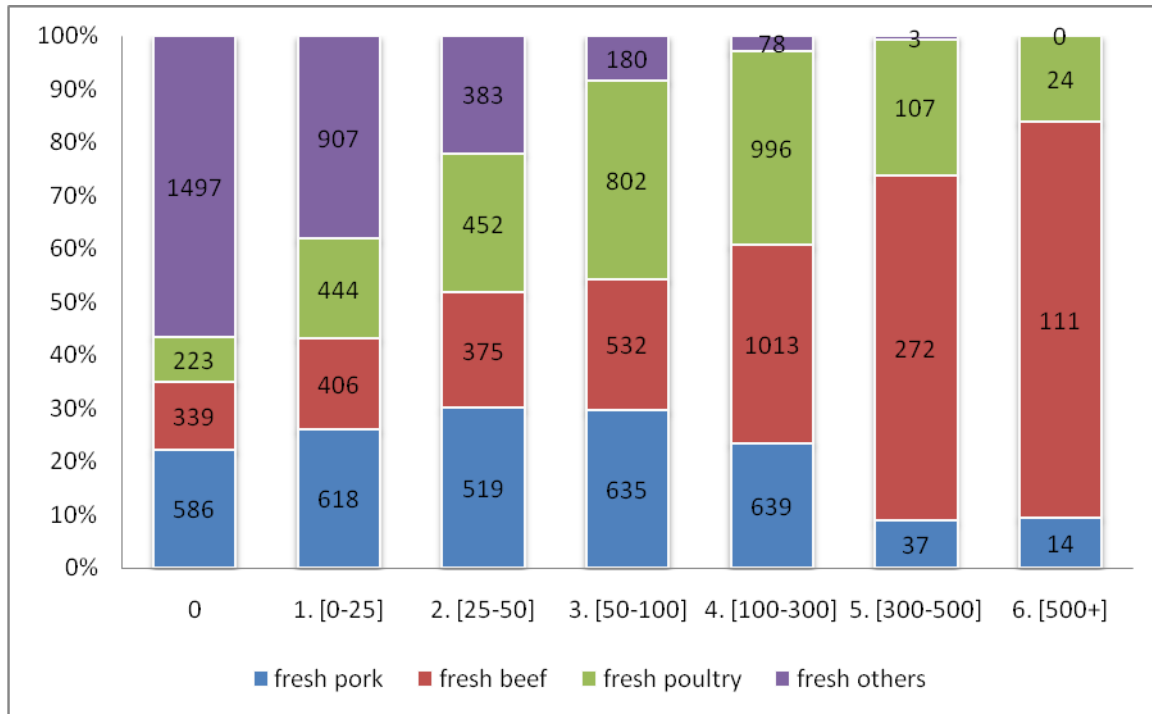
Table 4.9 Meat expenditure by semi processed meat category in Ontario from 2002-2007
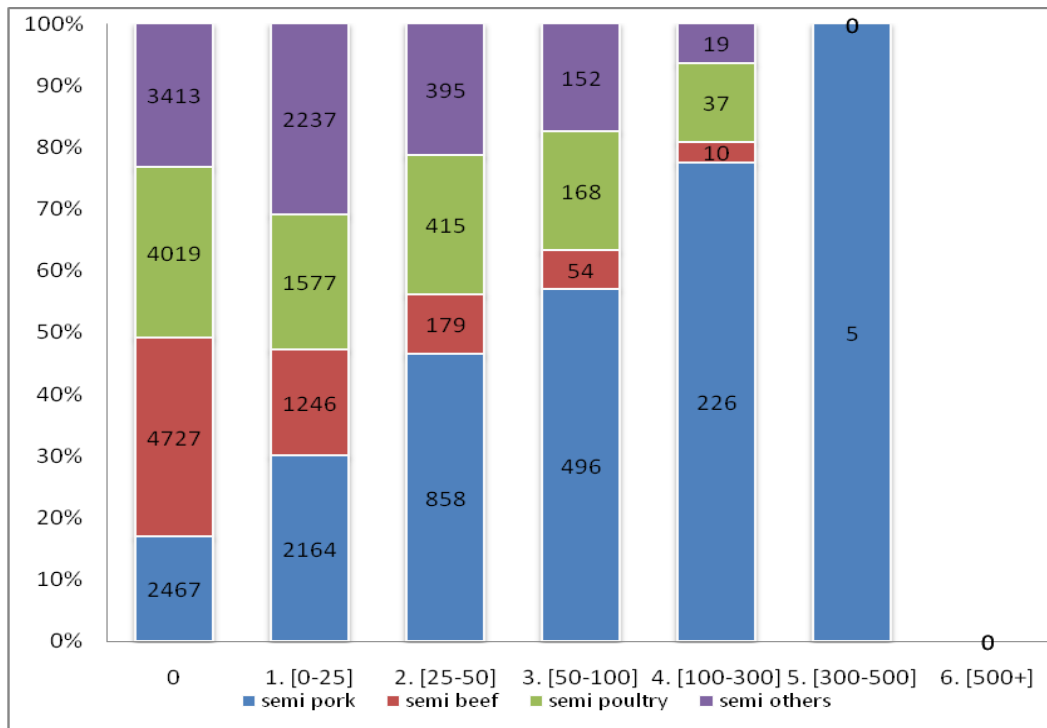
Table 4.10 Meat expenditure by semi processed meat category in Alberta from 2002-2007
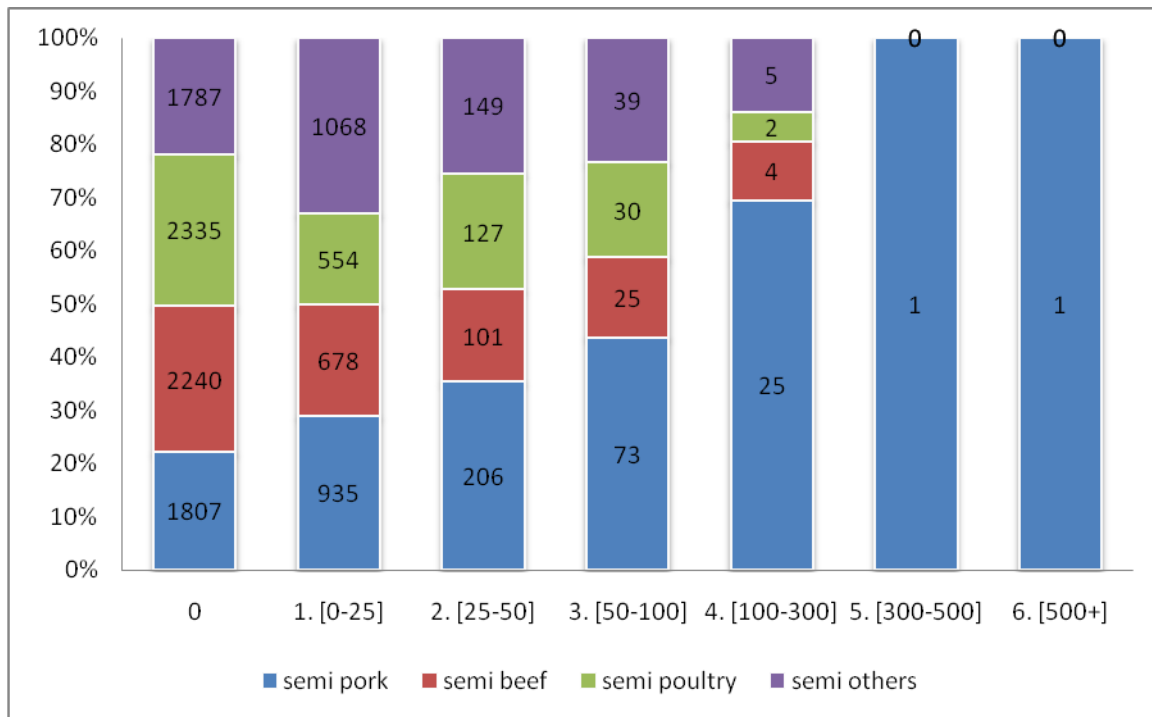
Table 4.11 Meat expenditure by fully- processed meat category in Ontario from 2002-2007
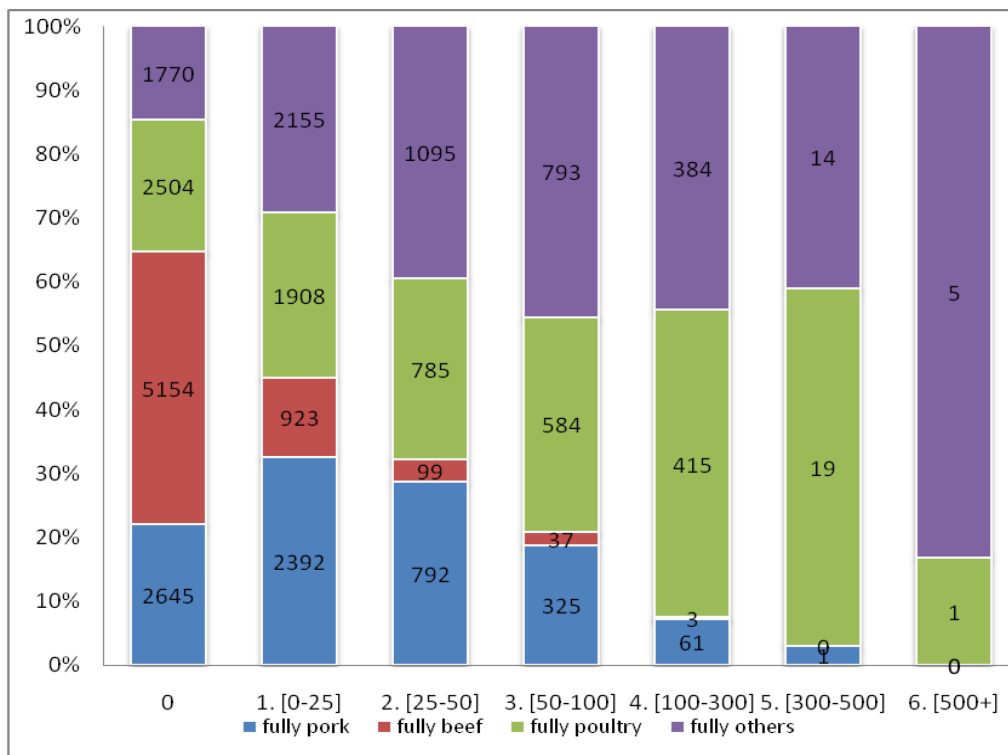
Table 4.12 Meat expenditure by fully- processed meat category in Ontario from 2002-2007
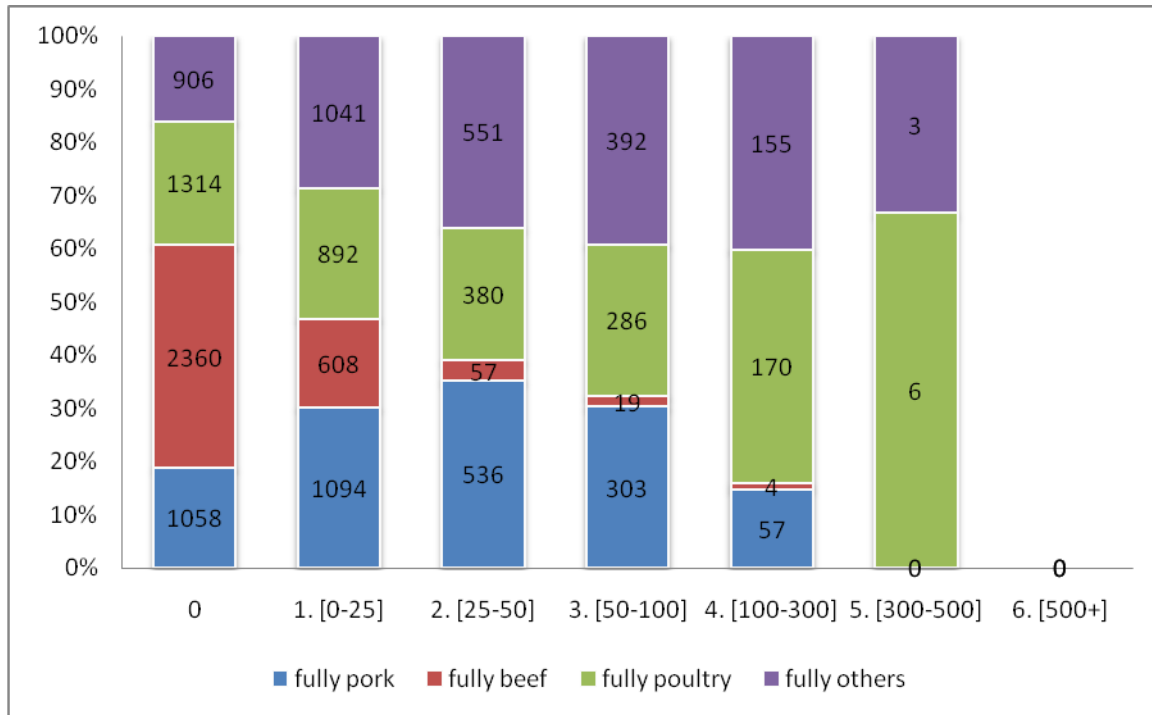
Table 4.13 Meat expenditure by all value added meat categories in Ontario from 2002-2007
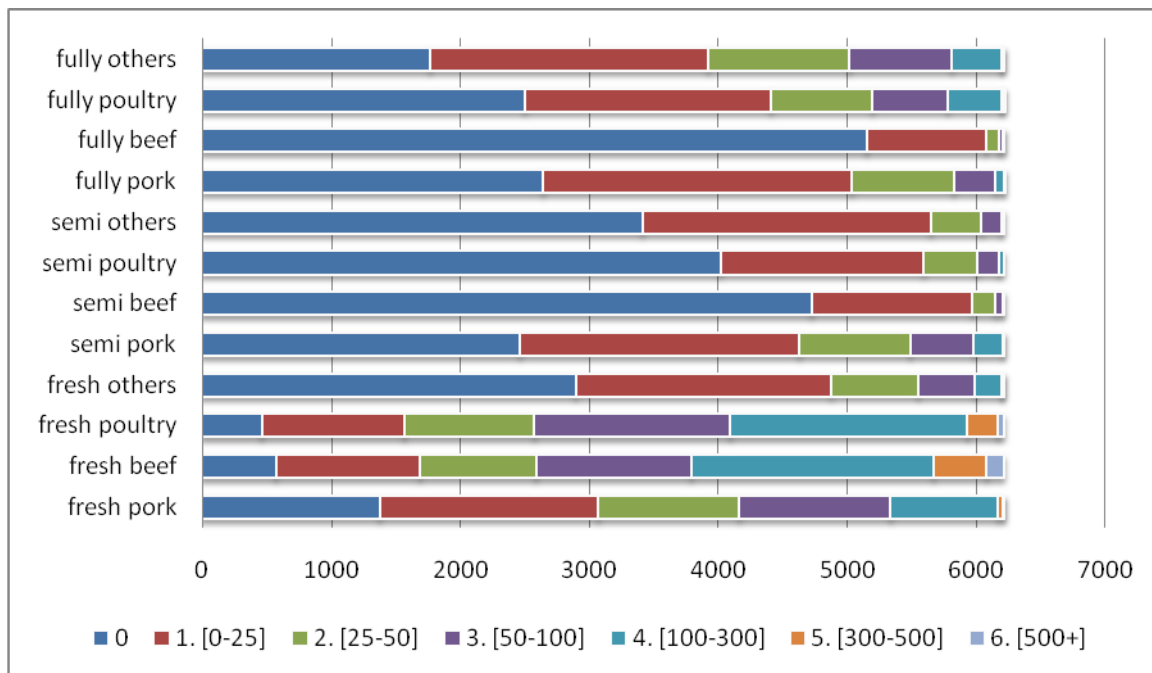
Table 4.14 Meat expenditure by all value added meat categories in Alberta from 2002-2007
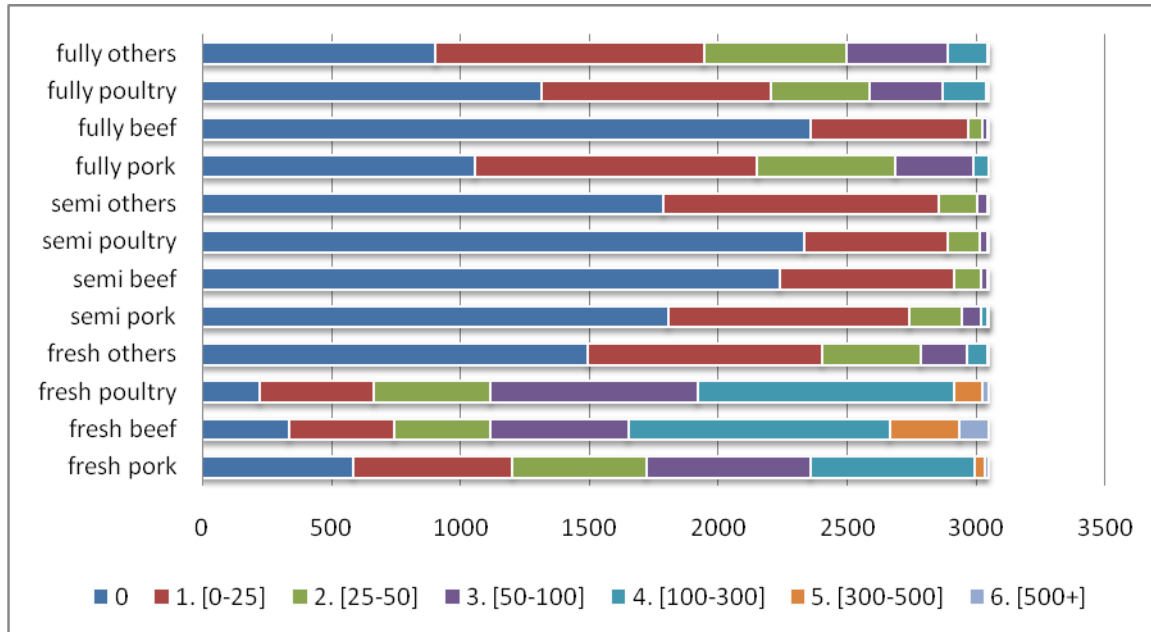
Model specification and econometric method

In this study a balanced panel of sample data in Ontario and Alberta are analyzed. Not all household have positive expenditures on all twelve meat categories. The positive value added meat expenditure shows that household have already made the decision to purchase and are able to choose one or more products from the twelve value added meat categories. We assume each household faces a two-step hierarchy in their decision making: the household first makes the decision of what types of value added meat to purchase (participation step), then they will decide how much expenditure they will spend once they choose the meat product types to purchase (expenditure step).

Therefore a two-step estimation following the Heien and Wessels (1990) Working-Leser demand system procedure is applied in the value added 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.

1.Participation decision by value added 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 value added meat i at period t and is $y_{iht} = 0$ if the household does not consume the meat product of 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 and total meat expenditure. The inverse mills ratio is actually the expectation of the structural residual, where the model is given by: (TSP 5.0 reference manual):

$$y_i = X_i \beta + \varepsilon_i \quad \varepsilon_i \sim N(0,1)$$

$$D_i = 1(y_i > 0)$$

And the inverse mills ratio is the value of the following two expressions, depending on whether D=0 or 1:

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

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

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 value added meat type ($\Pr[y_{iht} = 1]$) for a random effects panel 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 of households that do not purchase a particular value added meat is:

$$\Pr[y_{iht} = 0] = \Pr[X'_{iht}\beta + a_{iht} + \varepsilon_{ih} = 0] = 1 - \phi(X'_{iht}\beta)$$

where

$$X'_{iht}\beta = \beta_0 + \beta_1 * \text{MTotal} + \beta_2 * hage + \beta_3 * hhedu + \beta_4 * urban + \beta_5 * hhsize + \beta_6 * T$$

2.Expenditure decision by value added meat products

The second step is the estimation of the expenditure share equations of the Working-Leser demand system via seemingly unrelated regression (SUR) of the expenditure share that household h spends on value added meat i in time period t. In the Working-Leser model, each expenditure share of the meat product is a linear function of the log of prices and 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:

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

where

(i,j) represents the twelve value added meat products.

wi is the expenditure share of meat product i among the twelve value added meat products;

pj is the price of meat j;

Mtotal is the total expenditure of all meat products

M(-1) is the lagged meat i expenditure which may lead to a habit formation, where past consumption decisions serve as predictors of future purchase decisions

AD is the advertising information of meat i and other meat

HHINC is the household income

Kid is the presence of children in the household.

Chains represents the number of grocery store chains where household purchased the twelve meat products.

T is the time trend variable.

Model testing and empirical results

TSP International 5.0 was the econometric software used for the estimation of parameters in this study. Likelihood ratio tests (LRT) were applied to select the best fitting model among a number of models. The definitions of variables used for the analysis are listed in Table 4.20 below.

Table 4.20 Definition and sample statistics of variables used for value added meat choice analysis

Variables	*Definitions*	*Ontario*		*Alberta*	
		Mean	**SD**	**Mean**	**SD**
First stage: binary dependent variables					
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

Code	Description				
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
Logged form of meat price						
LP11	logged fresh pork price	1.96	0.09	2.00	0.10	
LP12	logged fresh beef price	2.11	0.03	2.08	0.05	
LP13	logged fresh poultry price	1.85	0.03	1.90	0.02	
LP14	logged fresh others price	1.70	0.07	1.62	0.08	
LP21	logged semi-processed pork price	1.44	0.05	1.74	0.22	
LP22	logged semi-processed beef price	1.73	0.05	2.14	0.13	
LP23	logged semi-processed poultry price	2.55	0.05	2.58	0.14	
LP24	logged semi-processed others price	2.57	0.07	2.61	0.08	
LP31	logged fully-processed pork price	1.69	0.10	1.77	0.06	
LP32	logged fully-processed beef price	1.06	0.12	1.16	0.13	
LP33	logged fully-processed poultry price	1.36	0.01	1.45	0.05	
LP34	logged fully-processed others price	1.40	0.05	1.79	0.04	
LP11oth	logged price except for fresh pork	1.85	0.03	1.91	0.03	
LP12oth	logged price except for fresh beef	1.74	0.03	1.84	0.02	
LP13oth	logged price except for fresh poultry	1.87	0.04	1.93	0.03	
LP14oth	logged price except for fresh others	1.88	0.04	1.94	0.02	
LP21oth	logged price except for semi- pork	1.88	0.03	1.93	0.03	
LP22oth	logged price except for semi- beef	1.87	0.03	1.92	0.02	

LP23oth	logged price except for semi- poultry	1.85	0.04	1.88	0.05
LP24oth	logged price except for semi- others	1.87	0.03	1.92	0.02
LP31oth	logged price except for fully- pork	1.95	0.03	1.99	0.02
LP32oth	logged price except for fully- beef	1.88	0.03	1.93	0.02
LP33oth	logged price except for fully- poultry	1.90	0.03	1.94	0.02
LP34oth	logged price except for fully- others	1.90	0.03	1.94	0.03
HH demographic and purchase information					
MTotal	Total expenditure on all types of meat	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(C$, midpoint)	52386	22189	51932	21909
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
T	year 1-6	3.50	1.71	3.50	1.71
Chains	Number of grocery chains HH visited	2.60	0.89	2.84	1.17

Variables	*Definitions*	*Ontario & Alberta*	
		Mean	**SD**
Advertising expenditure by meat types			
AD11	fresh pork AD	1726248	960208
AD12	fresh beef AD	1288502	580839
AD13	fresh poultry AD	8250415	1275109
AD14	fresh others AD	375781	354160
AD21	semi-processed pork AD	470236	427841
AD22	semi-processed beef AD	0	0
AD23	semi-processed poultry AD	39451	54549
AD24	semi-processed others AD	212510	234255
AD31	fully-processed pork AD	3591602	1465079
AD32	fully-processed beef AD	71519	98572
AD33	fully-processed poultry AD	1320833	1878608
AD34	fully-processed others AD	1178453	352855
AD11oth	Total AD except for fresh pork	1.67993D+07	1631576
AD12oth	Total AD except for fresh beef	1.72370D+07	1735378
AD13oth	Total AD except for fresh poultry	1.02751D+07	1575829
AD14oth	Total AD except for fresh others	1.81498D+07	1697066

AD21oth	Total AD except for semi-processed pork	1.80553D+07	2175070
AD22oth	Total AD except for semi-processed beef	1.85256D+07	1828122
AD23oth	Total AD except for semi-processed poultry	1.84861D+07	1843340
AD24oth	Total AD except for semi-processed others	1.83130D+07	1802960
AD31oth	Total AD except for fully-processed pork	1.49339D+07	1886875
AD32oth	Total AD except for fully-processed beef	1.84540D+07	1829559
AD33oth	Total AD except for fully-processed poultry	1.72047D+07	2383818
AD34oth	Total AD except for fully-processed others	1.73471D+07	2033027

Note: The source of these data is Nielsen Homescan™ Panel, Ontario & Alberta, 2002-2007 and Nielsen Media Measurement.

First stage: household participation decision results by types of value added meat

Tables 4.22 and 4.23 report the probability results for the Probit model for Ontario and Alberta (participation step)

TABLE 4.22 First-Step Probit Estimates for Ontario

Variables	fresh pork				semi- pork				fully- pork			
	Coeff.		t		Coeff.		t		Coeff.		t	
Constant	-0.618	***	-5.023		-0.990	***	-8.943		-1.304	***	-11.880	
MTOTAL	0.003	***	26.384		0.002	***	25.270		0.001	***	20.834	
HAGE	0.014	***	8.092		0.007	***	4.436		0.012	***	7.784	
HHEDU0	0.113	*	1.836		0.092	*	1.820		0.155	**	3.122	
URBAN	-0.312	***	-7.092		-0.108	**	-2.937		-0.172	***	-4.732	
HHSIZE	-0.013		-0.735		0.029	*	1.808		0.079	***	4.986	
T	-0.007		-0.604		0.062	***	6.206		0.067	***	6.853	
	fresh beef				semi- beef				fully- beef			
	Coeff.		t		Coeff.		t		Coeff.		t	
Constant	0.312	**	2.046		-1.439	***	-12.058		-1.523	***	-11.807	
MTOTAL	0.004	***	20.357		0.001	***	16.890		0.001	***	14.052	
HAGE	0.007	***	3.297		0.002		1.273		0.003	*	1.772	
HHEDU0	0.012		0.152		-0.027		-0.517		-0.115	**	-1.997	
URBAN	0.097	*	1.813		-0.090	**	-2.340		-0.106	**	-2.577	
HHSIZE	-0.137	***	-6.165		-0.020		-1.163		0.065	***	3.598	
T	-0.009		-0.637		0.093	***	8.695		-0.006		-0.524	
	fresh poultry				semi- poultry				fully- poultry			
	Coeff.		t		Coeff.		t		Coeff.		t	
Constant	0.133		0.793		-0.655	***	-6.023		0.797	***	7.325	

	Coeff.		t	Coeff.		t	Coeff.		t
MTOTAL	0.005	***	19.404	0.001	***	13.215	0.001	***	12.612
HAGE	0.008	***	3.163	-0.005	***	-3.529	-0.020	***	-12.780
HHEDU0	0.085		0.969	0.184	***	3.803	0.144	**	2.907
URBAN	0.121	**	2.042	-0.153	***	-4.292	-0.060	*	-1.666
HHSIZE	-0.042	*	-1.723	0.048	**	3.072	0.179	***	11.059
T	-0.041	**	-2.557	0.073	***	7.350	-0.034	***	-3.452

	fresh others			semi- others			fully- others		
	Coeff.		t	Coeff.		t	Coeff.		t
Constant	-1.231	***	-11.476	-0.378	***	-3.537	-0.428	***	-3.813
MTOTAL	0.001	***	17.031	0.001	***	17.728	0.001	***	13.190
HAGE	0.012	***	7.941	0.002		1.276	0.000		-0.272
HHEDU0	-0.062		-1.293	0.216	***	4.469	-0.097	**	-1.923
URBAN	0.123	***	3.497	-0.022		-0.611	-0.010		-0.265
HHSIZE	0.063	***	4.050	0.064	***	4.158	0.183	***	10.666
T	0.011		1.096	-0.119	***	-12.137	0.088	***	8.576

Note:***, **, * = significance at 1%, 5%, 10%

TABLE 4.23 First-Step Probit Estimates for Alberta

Variables	fresh pork			semi- pork			fully- pork		
	Coeff.		t	Coeff.		t	Coeff.		t
Constant	-0.633	***	-3.211	-1.172	***	-7.000	-0.902	***	-5.338
MTOTAL	0.004	***	19.795	0.001	***	15.599	0.002	***	15.747
HAGE	0.012	***	4.431	0.004	*	1.719	0.012	***	5.198
HHEDU0	0.015		0.179	-0.061		-0.919	0.126	*	1.840
URBAN	0.034		0.377	-0.132	*	-1.827	-0.209	**	-2.728
HHSIZE	0.000		-1.444	0.000		1.524	0.000		1.459
T	-0.032	*	-1.840	0.064	***	4.534	0.042	**	2.887

	fresh beef			semi- beef			fully- beef		
	Coeff.		t	Coeff.		t	Coeff.		t
Constant	-0.189		-0.825	-1.298	***	-7.294	-1.528	***	-8.347
MTOTAL	0.005	***	16.550	0.001	***	12.552	0.001	***	9.903
HAGE	0.006	**	2.051	0.006	*	2.451	0.006	**	2.386
HHEDU0	-0.102		-0.956	0.223	***	3.284	0.175	**	2.483
URBAN	0.260	*	2.557	0.032		0.408	-0.054		-0.705
HHSIZE	0.000	*	-1.754	0.000		0.132	0.000		-1.070
T	-0.045	**	-2.161	-0.045	**	-3.008	0.056	***	3.661

	fresh poultry			semi- poultry			fully- poultry		
	Coeff.		t	Coeff.		t	Coeff.		t
Constant	0.090		0.359	-1.480	***	-8.064	0.407	**	2.521

MTOTAL	0.004	***	13.637	0.001 ***	10.067	0.001 ***	9.797
HAGE	0.005		1.482	-0.006 *	-2.311	-0.009 ***	-3.982
HHEDU0	-0.087		-0.743	0.018	0.259	0.510 ***	7.573
URBAN	0.181		1.599	0.061	0.745	-0.180 **	-2.521
HHSIZE	0.000		-1.123	0.000 ***	4.101	0.000	0.433
T	0.007		0.285	0.105 ***	6.819	-0.010	-0.750

	fresh others		semi- others		fully- others	
	Coeff.	t	Coeff.	t	Coeff.	t
Constant	-0.807 ***	-4.978	-0.533 ***	-3.255	-0.035	-0.207
MTOTAL	0.001 ***	12.836	0.001 ***	13.170	0.001 ***	9.409
HAGE	0.003	1.493	0.002	0.702	-0.002	-0.785
HHEDU0	-0.051	-0.786	0.086	1.330	0.262 ***	3.710
URBAN	0.005	0.075	-0.007	-0.091	-0.157 **	-2.088
HHSIZE	0.000 *	1.881	0.000	0.494	0.000 **	2.703
T	0.039 **	2.862	-0.070 ***	-5.029	0.076 ***	5.202

Note:***, **, * = significance at 1%, 5%, 10%

TABLE 4.24 Second-Step Working-Leser Model Estimates for Ontario

	fresh pork		semi- pork		fully- pork	
Parameter	Coeff.	t	Coeff.	t	Coeff.	t
Constant	0.121333	0.442735	-0.72437 **	-2.82433	0.508032 **	2.68751
LTE	0.049849 ***	11.4302	9.35E-03 **	2.82861	-0.01715 ***	-5.00643
Mills	8.17E-04	0.762153	0.012289 ***	16.7339	0.012534 ***	17.3432
LM(-1)	4.00E-03 ***	3.57762	4.42E-03 ***	4.95776	4.23E-03 ***	4.24575
LP	-0.14105 **	-1.95817	0.079179 **	2.28146	-0.01542	-0.33732
AD	-3.86E-09	-1.3331	7.43E-09	1.35328	4.16E-09 *	1.7978
ADOTH	5.83E-10	0.458554	1.16E-09	1.24433	-1.19E-09 **	-2.06606
HHINC	-4.02E-07 ***	-5.69493	-8.66E-08 *	-1.94837	-2.71E-08	-0.62719
KID1	-0.01734 ***	-4.06616	-4.42E-03	-1.58415	-0.01013 ***	-4.72189
CHAINS	3.00E-03 *	1.87378	-2.09E-03 **	-2.13245	-1.23E-03	-1.30823
LPOTH	0.108861	1.21511	0.31361 **	2.76292	-0.21814 *	-1.76436
HHSIZE	-3.26E-03 *	-1.85936	2.01E-03 *	1.7434	2.91E-03 **	3.0194
T	-0.01097 **	-2.18149	7.01E-03 ***	4.36105	6.85E-03	1.53851

	fresh beef		semi- beef		fully- beef	
Parameter	Coeff.	t	Coeff.	t	Coeff.	t
Constant	1.40566 **	1.96388	-0.09667	-1.56232	-1.90258 ***	-3.20577
LTE	0.123538 ***	15.691	5.33E-03 ***	4.10106	3.92E-03 **	2.96444
Mills	-0.03832 ***	-18.1595	6.04E-03 ***	7.86727	1.72E-03 *	1.74297
LM(-1)	5.99E-04	0.434862	-9.43E-03 ***	-11.2116	-0.01575 ***	-13.274

Parameter	Coeff.		t	Coeff.		t	Coeff.		t
LP	-0.71	**	-2.15402	-0.07583		-1.27315	-0.12269	***	-3.27899
AD	-1.79E-08	**	-3.00707	7.51E-08		1.52711	-5.04E-08	**	-2.63309
ADOTH	1.22E-09		0.760741	-3.33E-10	*	-1.72975	9.39E-10	**	2.35481
HHINC	-5.37E-07	***	-4.44169	-7.25E-08	***	-4.35607	-2.39E-08		-1.46191
KID1	-1.11E-03		-0.14872	-1.31E-03		-1.10675	-1.41E-03		-1.32692
CHAINS	-5.25E-03	**	-1.95763	7.13E-04	*	1.75875	-3.97E-04		-0.96735
LPOTH	0.114787		0.579503	0.12228		1.54442	1.02152	***	3.21509
HHSIZE	-0.01971	***	-6.5135	-7.95E-05		-0.18539	1.51E-03	***	3.66988
T	-0.01464	**	-2.66782	1.80E-03	***	3.51926	0.026509	***	3.18899

	fresh poultry			semi- poultry			fully- poultry		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	-1.91098	**	-2.92238	0.35164		1.08674	0.753191		1.51246
LTE	7.38E-03		0.888812	-0.02128	***	-5.78217	-0.04798	***	-8.78903
Mills	-0.03808	***	-17.176	0.010847	***	12.1888	5.98E-03	***	7.35398
LM(-1)	-2.42E-03	*	-1.65724	1.35E-04		0.108294	5.31E-03	***	5.31726
LP	1.15074	**	2.76044	-0.02629		-0.85571	-0.13091		-0.70695
AD	-7.70E-09	*	-1.66226	-1.19E-08		-0.29601	2.75E-09		0.972586
ADOTH	-1.56E-08	**	-3.0206	5.10E-10		0.768641	-5.74E-10		-0.40544
HHINC	6.28E-07	***	5.33943	6.73E-08		1.44785	3.03E-07	***	3.93839
KID1	1.86E-03		0.253736	1.44E-03		0.604245	0.03031	***	5.54961
CHAINS	2.19E-03		0.828031	-5.58E-04		-0.53583	1.65E-03		0.919288
LPOTH	0.101108		0.363617	-0.12082		-0.83782	-0.20235		-0.72054
HHSIZE	-9.30E-03	**	-2.97854	1.25E-03		1.1916	9.86E-03	***	4.49191
T	7.38E-03		1.46607	4.38E-04		0.165583	-0.01339	*	-1.77896

	fresh others			semi- others			fully- others		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	1.65917	***	4.4946	0.077665		0.531027	0.757904	**	2.2859
LTE	-0.01939	***	-5.21889	-0.01044	***	-3.85522	-0.08313	***	-12.2641
Mills	0.01154	***	15.1608	0.011703	***	15.9965	2.93E-03	***	3.69196
LM(-1)	5.50E-03	***	5.43072	6.94E-05		0.070209	3.34E-03	***	3.32149
LP	0.222764	**	2.28927	-0.02265		-1.29608	-0.20785		-1.20903
AD	3.03E-09		0.477318	5.04E-10		0.171767	-1.18E-09		-0.14289
ADOTH	1.46E-08	***	3.33407	-2.51E-10		-0.70288	-1.06E-09		-0.86403
HHINC	8.08E-08		1.35996	-1.46E-07	***	-4.05897	2.16E-07	**	2.53011
KID1	-7.97E-03	**	-1.96611	-2.65E-03		-1.38873	0.012736	**	2.73983
CHAINS	2.99E-03	**	2.18471	1.25E-04		0.161426	-1.15E-03		-0.60647
LPOTH	-1.14324	***	-3.85992	0.019497		0.336287	-0.11711		-0.60907
HHSIZE	2.47E-03		1.57023	4.18E-03	***	4.67067	8.16E-03	***	3.60735
T	-0.02075	***	-3.63169	-1.30E-03		-1.53459	0.011058		1.48188

TABLE 4.25 Second-Step Working-Leser Model Estimates for Alberta

	fresh pork			semi- pork			fully- pork		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	-0.36094		-1.21071	-0.54849	**	-2.57109	-0.59213		-1.64228
LTE	0.072953	***	11.1937	-2.33E-03		-0.83465	-0.03013	***	-4.76154
Mills	-8.33E-04		-0.4805	0.011623	***	10.8757	7.99E-03	***	6.82324
LM(-1)	2.42E-03		1.49012	-7.42E-04		-0.5571	2.78E-03	**	1.98723
LP	0.114247	*	1.78142	0.052929	***	3.79966	0.117679	**	2.34933
AD	-2.85E-09		-0.92505	1.42E-08	**	3.15502	-3.36E-09		-1.42474
ADOTH	-4.98E-10		-0.26117	8.66E-10		1.08029	5.78E-10		0.413931
HHINC	-5.83E-07	***	-5.49193	-3.19E-08		-0.74184	-7.78E-08		-1.06732
kid0	0.010719	**	2.11242	-9.77E-04		-0.51114	7.27E-03	**	2.23362
CHAINS	-1.14E-03		-0.58121	-7.71E-04		-1.06931	-3.70E-04		-0.25247
LPOTH	0.067413		0.595339	0.244734	**	2.39185	0.262009		1.299
T	-3.16E-05		-7.52E-03	-1.47E-03	**	-1.97216	-1.23E-03		-0.38882

	fresh beef			semi- beef			fully- beef		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	0.351397		0.375913	6.94E-03		0.064486	-0.07591		-0.65227
LTE	0.165816	***	14.9388	2.60E-03	*	1.78283	2.15E-03		1.00377
Mills	-0.02996	***	-9.78286	7.37E-03	***	8.83481	3.20E-03	**	3.07584
LM(-1)	9.24E-03	***	4.67642	-2.38E-03	**	-2.11802	-5.70E-03	***	-3.81235
LP	0.233931		1.21344	2.63E-03		0.218598	0.011191		0.791032
AD	2.71E-09		0.227366	6.77E-08	*	1.75914	-2.22E-08	**	-2.19256
ADOTH	6.61E-10		0.258197	2.18E-10		0.508088	-7.57E-10	**	-2.76303
HHINC	-6.68E-07	***	-4.29446	-2.71E-08		-1.44794	-3.08E-08		-1.5842
kid0	0.030908	***	3.87672	-2.68E-03	**	-2.41227	-1.62E-03		-1.60216
CHAINS	-5.25E-03	*	-1.88588	9.77E-04	**	2.68324	7.61E-04	**	2.23761
LPOTH	-0.5109		-1.441	-5.37E-03		-0.1128	0.040548		0.61035
T	-6.62E-03	**	-2.08502	-5.98E-04		-1.21761	1.07E-03		0.764119

	fresh poultry			semi- poultry			fully- poultry		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	1.27271	*	1.85226	-0.27883	**	-3.0463	-0.54284		-0.84665
LTE	-0.01671		-1.35518	-7.59E-03	**	-2.53948	-0.04904	***	-5.98104
Mills	-0.03841	***	-10.1141	0.010576	***	7.55185	5.61E-03	***	4.8768
LM(-1)	-1.14E-03		-0.48785	-7.63E-03	***	-5.62058	5.12E-03	***	3.75769
LP	-0.60068	**	-2.0219	0.033497	**	2.28764	0.057502		0.503953
AD	1.95E-09		0.821185	-2.61E-08		-0.8098	-1.98E-09		-0.63167
ADOTH	-1.68E-09		-0.6981	2.37E-10		0.590536	-1.96E-09		-0.79922
HHINC	3.11E-07	*	1.89554	1.25E-07	***	3.57833	2.96E-07	**	2.74588
kid0	-7.07E-03		-0.92891	-1.31E-03		-0.86632	-0.02471	***	-4.88868
CHAINS	8.97E-04		0.332165	1.30E-03	**	2.36912	2.52E-03		1.35102
LPOTH	0.08225		0.552735	0.103963	***	3.36522	0.349559		1.24489
T	-3.95E-03		-1.00352	5.27E-03	***	5.24157	-9.55E-05		-0.02401

Parameter	fresh others			semi- others			fully- others		
	Coeff.		t	Coeff.		t	Coeff.		t
Constant	0.670195		1.20833	0.236347	*	1.92964	0.86154		0.674804
LTE	-0.02139	***	-3.3616	-0.01262	**	-3.06677	-0.10372	***	-9.89158
Mills	0.015338	***	13.4247	0.01039	***	9.33132	-2.91E-03	**	-2.49723
LM(-1)	3.47E-03	**	2.57077	-5.50E-03	***	-4.97079	6.51E-05		0.046402
LP	0.078099		0.656588	-0.09806	**	-2.67214	-2.97E-03		-0.01169
AD	-9.28E-09		-0.59227	-1.73E-08	***	-3.50032	-3.41E-09		-0.24573
ADOTH	1.52E-09		1.3386	-8.56E-10		-1.39026	1.67E-09		0.783073
HHINC	1.54E-07	**	2.34258	1.02E-08		0.324391	5.21E-07	***	4.19447
kid0	8.14E-03	**	2.95743	-5.58E-03	**	-2.19674	-0.01309	**	-2.24579
CHAINS	2.59E-03	**	2.47472	1.67E-03	**	2.69032	-3.19E-03		-1.60862
LPOTH	-0.38507		-1.03333	0.0402		0.875707	-0.28933		-0.65954
T	-6.92E-04		-0.4386	3.51E-03	**	2.10669	4.83E-03	**	2.26344

Results

The results for each of the above models show some similarities and some differences across regions. In the first stage of the model in Ontario, older aged, better educated households with larger household sizes are all more likely to purchase fresh, semi-processed and fully processed pork products but urban dwellers are less likely to purchases each of the pork products. In Alberta, only age is a significant explanatory for any pork purchase decision although urban dwellers are less likely to purchase semi or fully processed pork. In both provinces there is evidence of an increased tendency to purchase pork products over time. Comparing pork and all other meat products in Ontario the results suggest that older aged households are more likely to purchase semi and fully processed beef products, are less likely to purchase semi and fully processed poultry products and more likely to purchase semi and fully processed other meat products (mainly seafood). Household size has a positive impact on purchases of all semi and fully processed meat products (except semi processed beef) and higher education levels have positive impacts on the decision to purchase semi and fully processed poultry but mixed effects on beef and other meats. The results are much less consistent for Alberta with age of household head being the most consistent explanatory of the decision to purchase any meat in fresh, semi or fully processed form. In the models explaining the level of expenditure for each of the twelve

meat types the consistent explanators appear to be the household size and/or having children in the household (in both provinces). Price responses, when statistically significant, suggest inelastic demands for most of the twelve meat types in both provinces (a 1% decrease (increase) in price results in a less than one percent increase (decrease) in quantity sold). Advertising effects do not appear to be significant across the twelve meat types in explaining the level of meat expenditure. Households with children are likely to spend less on semi and fully processed pork and beef but likely to spend more on fully processed poultry products. In Ontario households with higher levels of income are likely to spend less on all types of pork, on fresh and semi-processed beef but more on all types of poultry and fresh and semi-processed other meat products. In Alberta the effects of income are negative for fresh pork and beef but positive for all types of poultry products.

Canadian Store Choice Analysis

Introduction

The second objective of the study is to investigate how Canadian households make store choice decisions in purchasing meat products. In particular, the analysis focuses on the impact of store advertising and household demographic variables on store choice purchasing patterns. First, this section provides the data generation for the analysis followed by the data descriptive statistics. Then the explanation of model specification and econometric method are given. The model results and summary are provided in the conclusion.

Data setup and descriptive statistics

Nielsen Homescan™ data is the source of data in this analysis. 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. According to estimated marketing shares, shopping trips and regional differences, six grocery chains are selected for specific analysis in each province (Ontario and Alberta). In Ontario, the six grocery chains include: Loblaws, Metro, Safeway, Co-op, Sobeys (Empire), and all others. In Alberta, the six grocery chains are Loblaws, Safeway, Co-op, Empire, JPG (Save On Foods) and all others. Loblaws, Safeway, and Co-op are used in both provincial store choice models to make a comparison. In the following section a summary and short history for each of the grocery chains is provided.

Market share

Aggregate annual meat expenditure market share for each of the grocery store chains for the period 2002 to 2007 (for the Homescan panelists in this study) are reported in this section.

Error! Reference source not found. below reports aggregate market shares for each of six grocery store chains in Ontario and Alberta.

Table 5.1. Market share for store meat expenditure in Ontario and Alberta.

YEAR	2002	2003	2004	2005	2006	2007
Coop	0%	0%	0%	0%	0%	0%
METRO	28%	31%	29%	27%	27%	26%
Safeway	0%	0%	1%	0%	0%	0%
others	3%	4%	5%	5%	6%	6%
Loblaws	52%	47%	48%	48%	48%	49%
Empire	15%	18%	18%	19%	18%	18%

Source: Nielsen Homescan™ Panel, Ontario 2002 to 2007

YEAR	2002	2003	2004	2005	2006	2007
Coop	17%	15%	15%	15%	17%	17%
Empire	17%	16%	16%	17%	18%	16%
JPG	8%	7%	6%	5%	6%	7%
Loblaws	15%	17%	16%	18%	21%	23%
Safeway	39%	42%	43%	40%	34%	31%
others	4%	4%	5%	5%	5%	6%

Source: Nielsen Homescan™ Panel, Alberta 2002 to 2007

Table 5.2 Market Share and Household Spending, by category, , in Ontario and Alberta

$	Coop	Empire	Loblaws	METRO	Safeway	others
0	6199	2710	706	1653	6157	3733
[0-50]	16	1682	1456	1716	17	1806
[50-100]	1	639	941	847	16	391
[100-300]	6216	816	1856	1367	17	259
[300-500]	0	219	660	400	6	20
[500-1000]	0	127	493	197	3	7
[1000+]	0	23	104	36	0	0
%	Coop	Empire	Loblaws	METRO	Safeway	others
0	6199	2710	706	1653	6157	3733
0-20%	13	1714	1257	1548	14	1777
20-40%	1	701	1060	1012	12	383
40-60%	1	458	919	739	15	150
60-80%	1	337	832	614	9	81
80%<	1	296	1442	650	9	92

Source: Nielsen Homescan™ Panel, Ontario 2002 to 2007

$	Coop	Empire	JPG	Loblaws	Safeway	others
0	1907	1381	2231	1298	914	1905
[0-50]	357	769	431	741	625	787
[50-100]	192	301	142	347	341	189
[100-300]	359	398	185	443	625	154
[300-500]	139	113	41	134	273	10
[500-1000]	87	80	16	73	221	3
[1000+]	7	6	2	12	49	
%	Coop	Empire	JPG	Loblaws	Safeway	others
0	1907	1381	2231	1298	914	1905
0-20%	389	874	455	813	602	835
20-40%	226	304	137	357	374	166
40-60%	138	186	90	204	306	68
60-80%	133	138	48	158	319	43
80%<	255	165	87	218	533	31

Source: Nielsen Homescan™ Panel, Alberta 2002 to 2007

Table 5.3. Number of grocery store chains visited in Ontario and Alberta, 2002-2007
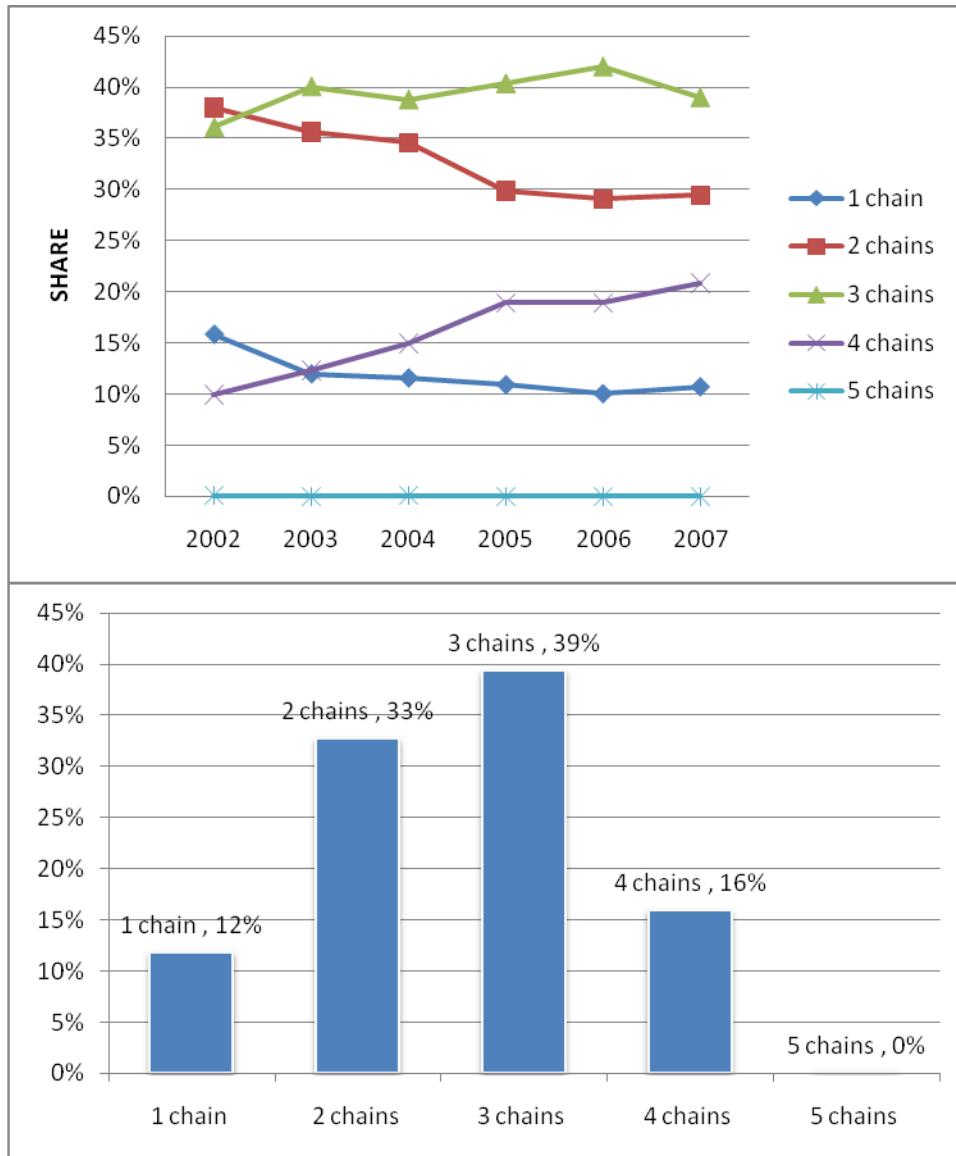
Source: Nielsen Homescan™ Panel, Ontario 2002 to 2007
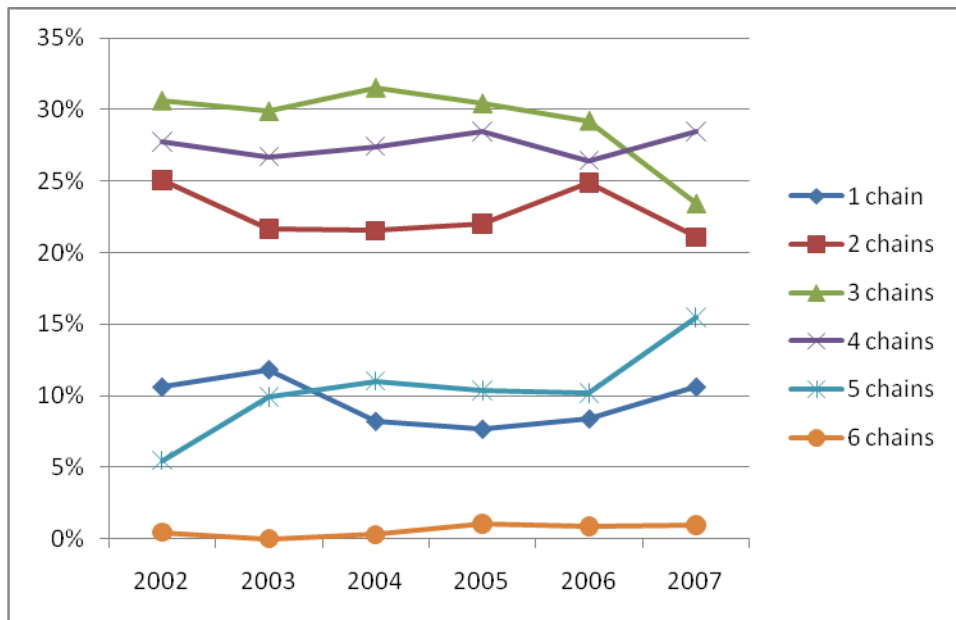
Source: Nielsen Homescan™ Panel, Alberta 2002 to 2007

Model specification and econometric method

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 fourth section of this report. Due to the zero consumption problem, not all households in Ontario and Alberta have positive expenditures at all six grocery chains. Each household is assumed to face 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 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 that determines 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

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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 same method as in Chapter 4, the grocery store participation decision is modeled as a function of household demographic variables and total meat expenditure in all grocery stores.

So the likelihood of household grocery store participation decision $(\Pr[y_{iht} = 1])$ for a random effects panel 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 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

$$X_{iht}^t \beta = \beta_0 + \beta_1 * \mathrm{Texp} + \beta_2 * hhinc + \beta_3 * hage + \beta_4 * hages + \beta_5 * urban + \beta_6 * hhsize + \beta_7 * T$$

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 regression (SUR) of the expenditure share 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:

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

where

(i) represents the one of the six grocery store chains in Ontario and Alberta;

wi is the store expenditure share of grocery chain i;

Texp is the total expenditure of all grocery store chains;

M(-1) is the lagged store i expenditure (on year lag) which may lead to a habit formation, where past consumption decisions serve as predictors of future purchase decisions;

AD is the advertising information(one year lag) of grocery chain i in a given year;

ADoth is the advertising information(one year lag) of other grocery chains in a given year;

HHINC is the household income;

Kid is the presence of children in the household;

Chains represents the number of grocery store chains where household visited.

T is the time trend variable.

Expenditure elasticity:

Model testing and empirical results

Likelihood ratio tests (LRT) are applied to select the best fitting model among a number of models. The definitions of variables used for the analysis are listed below.

Table 5.4 Definition and sample statistics of variables used for store choice analysis

Variables	Definitions	Ontario Mean	SD	Alberta Mean	SD
First stage binary dependent variables					
PCOOP	1 if choose Coop, 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 Loblaws, 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 Coop	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 Loblaws	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 Coop	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 Loblaws	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(C$, midpoint)	52386	22189	51932	21909
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 visited	2.596	0.894	2.839	1.175

Table continued...

Variables	Definitions	Ontario		Alberta	
		Mean	SD	Mean	SD
Advertising expenditure by grocery store chains					
TA1COOP	One year lag of AD for Coop	1903227	652783	1903227	652837
TA1EMP	One year lag of AD for Sobeys	8604716	1003701	8604716	1003784
TA1LOB	One year lag of AD for Loblaws	9552057	932734	9552057	932812
TA1MET	One year lag of AD for Metro	5505401	960972	N/A	N/A
TA1JPG	One year lag of AD for Save on foods	N/A	N/A	4712313	1906918
TA1SAFE	One year lag of AD for Safeway	1.41689D+07	2681527	1.41689D+07	2681752
TA1OTH	One year lag of AD for othes	2.72842D+07	3295569	2.80773D+07	1437932
TA2COOP	two years lag of AD for Coop	1707535	685734	1707535	685791
TA2EMP	two years lag of AD for Sobeys	8731168	1150445	8731168	1150542
TA2LOB	two years lag of AD for Loblaws	9018072	1064810	9018072	1064899
TA2MET	two years lag of AD for Metro	5465500	883694	N/A	N/A
TA2JPG	two years lag of AD for Save on foods	N/A	N/A	3748053	2110160
TA2SAFE	two years lag of AD for Safeway	1.27778D+07	2467236	1.27778D+07	2467442
TA2OTH	two years lag of AD for others	2.68634D+07	3335412	2.85809D+07	3215373

The first stage estimation results are reported in Tables 5.5 and 5.6 below. In Ontario households who spend more on meat are more likely to shop at Empire, Loblaws, Metro and less likely to shop at 'other' grocery stores. Higher incomes, older household head age and larger household size explain the decision to purchase meat at a Loblaws store (including all stores owned by Loblaws). Over time more households are choosing to purchase meat at Metro, Empire and other grocery stores. Households in urban areas are less likely to shop at Empire, Loblaws but more likely to shop at Metro and other grocery stores. In comparison, in Alberta households who spend more on meat are more likely to spend that money at Co-op, Empire, Loblaws and Safeway grocery stores (reflecting the increasing concentration in the grocery retailing industry in Canada). Urban dwellers are less likely to buy meat at Co-op, Empire, Loblaws but more likely to make meat purchases at JPG and Safeway. Larger household size suggests an increased probability of purchasing meat at Co-op, Empire, Loblaws and other grocery stores. In Alberta higher income households are more likely to make meat purchases at Loblaws, JPG and other grocery stores and less likely to make meat purchases at Co-op stores. Over time, for these households, the probability of purchasing meat is growing at Empire, Loblaws and other grocery stores and declining at Safeway stores.

TABLE 5.5. First-Step Probit Estimates of Ontario

Variables	Co-op Coeff.	Co-op t	Empire Coeff.	Empire t	Loblaws Coeff.	Loblaws t
C	-6.78106 **	-2.79104	0.239926	0.728832	-0.752197 **	-1.82496
TEXP	-7.13E-04 *	-1.87758	3.60E-04 ***	6.42638	9.12E-04 ***	9.68237
HHINC	1.28E-06	0.282428	-1.01E-06	-1.23395	2.19E-06 **	2.02138
HAGE	0.184495 *	1.90583	-0.017894	-1.43564	0.046938 **	2.99261
HAGES	-1.96E-03 **	-2.05538	2.28E-04 **	1.97019	-3.83E-04 **	-2.61733
T	-0.075856	-1.47433	0.031567 ***	3.31633	3.21E-03	0.252021
URBAN	0.030476	0.158377	-0.220275 ***	-6.18276	-0.103392 **	-2.14611
HHSIZE	0.100847	1.44663	0.057763 ***	3.6628	0.110101 ***	5.00125

Variables	Metro Coeff.	Metro t	Safeway Coeff.	Safeway t	Others Coeff.	Others t
C	1.42765 ***	3.96679	-4.29054 ***	-3.39826	-0.875792 **	-2.622
TEXP	1.52E-04 **	2.72058	-2.59E-04	-1.34681	-2.33E-04 ***	-4.20999
HHINC	-1.10E-06	-1.27254	-1.26E-06	-0.507808	2.57E-06 ***	3.06324
HAGE	-0.040289 **	-2.96282	0.078985 *	1.6783	-0.019865	-1.5694
HAGES	4.01E-04 ***	3.18104	-7.43E-04 *	-1.73004	2.04E-04 *	1.738
T	0.016788 *	1.65743	0.03414	1.17678	0.102469 ***	10.4763
URBAN	0.190689 ***	5.12177	-0.050178	-0.475992	0.131301 ***	3.61173
HHSIZE	-0.01832	-1.10424	4.45E-03	0.090857	0.233075 ***	14.4603

TABLE 5.6. First-Step Probit Estimates of Alberta

Variables	Co-op Coeff.	Co-op t	Empire Coeff.	Empire t	Loblaws Coeff.	Loblaws t
C	-0.426286 ***	-4.649930	-0.048825	-0.531572	-0.275020 **	-3.016070
TEXP	0.000199 **	2.694440	0.000645 ***	8.313550	0.000436 ***	5.538200
KID1	-0.276462 ***	-3.292030	0.001383	0.016389	0.025023	0.298622
HHINC	-0.000002 **	-2.139450	-0.000001	-0.989910	0.000002 **	2.172410
T	0.011435	0.832403	0.026846 **	1.967770	0.041672 **	3.057700
URBAN	-0.204854 ***	-4.071010	-0.447434 ***	-8.723360	-0.226411 ***	-4.461060
HHSIZE	0.132551 ***	4.244100	0.076410 **	2.431640	0.069205 **	2.212200

Variables	JPG Coeff.	JPG t	Safeway Coeff.	Safeway t	Others Coeff.	Others t
C	-0.758335 ***	-7.770250	0.165426 *	1.695730	-1.062700 ***	-11.233200
TEXP	0.000056	0.737098	0.000958 ***	10.107500	0.000044	0.590272
KID1	0.143320	1.639150	0.085657	0.954490	-0.143739 *	-1.716510
HHINC	0.000003 **	2.122960	0.000000	0.148954	0.000004 **	3.056050
T	-0.015196	-1.056880	-0.045352 **	-3.084570	0.077385 ***	5.543680
URBAN	0.150495 **	2.778470	0.762524 ***	14.582500	-0.278282 ***	-5.477800
HHSIZE	-0.044241	-1.343190	-0.159071 ***	-4.740220	0.202521 ***	6.399090

The second stage estimation results are reported in Tables 5.7 and 5.8. These results show significant explanatory variables for the decision on level of spending on meat at each of the grocery store chains. The number of grocery store chains shopped at by a household is a significant determinant of level of meat spending at all chains except Loblaws in Ontario. In Alberta the number of chains shopped at is positively related to the level of spending at Empire, JPG and other stores but is negatively related to the level of spending at Safeway and Loblaws brand stores. In Alberta, households with higher levels of education spend more on meat at Co-op, Loblaws and JPG and less at Empire and Safeway. In Ontario households with higher levels of education spend more on meat at Metro and less at Empire. Households with larger sizes spend more on meat at Loblaws and other stores in Ontario and at Co-op, Loblaws and others in Alberta. Store advertising has no significant effects in Alberta but has small positive effect on meat spending for Co-op and Safeway stores in Ontario – both non-traditional and small retailers in Ontario.

TABLE 5.7. Second-Step Working-Leser Demand Estimates for Ontario

	Co-op			Empire			Loblaws		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	-0.0889	***	-3.76	0.312097	***	4.41	0.134206		1.32
LTE	5.23E-03	***	4.79	-3.84E-04		-0.12	0.036371	***	7.52
AD	1.28E-08	***	8.87	-5.27E-09	**	-3.08	5.00E-09		1.58
ADoth	2.74E-11		0.09	-2.75E-09	**	-2.24	2.57E-09		1.55
HHEDU1	9.58E-05		0.07	-0.034429	***	-4.00	-9.78E-03		-0.93
Chains	0.023847	***	8.43	0.022994	***	5.39	-0.084334	***	-17.63
HHINC	3.73E-08		1.38	-3.94E-07	**	-2.77	5.63E-07	**	2.92
T	-7.71E-03	***	-6.62	7.26E-03	*	1.74	-0.012336	**	-2.13
HHSIZE	-1.28E-04		-0.18	-1.10E-03		-0.44	0.011428	***	3.23
Mills	-0.243014	***	-5.02	0.047491	***	5.35	0.030311	**	2.10
Urban	-7.28E-04		-0.53	-0.042543	***	-6.88	-0.013403	*	-1.64
LM(-1)	-0.35268	***	-10.98	0.06971	***	19.70	0.081649	***	18.90
	Metro			Safeway			Others		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	0.389731	***	4.17	0.062283	**	2.98	0.190583	***	4.10
LTE	-4.88E-03		-1.14	4.86E-03	***	8.32	-0.041199	***	-14.96
AD	-4.30E-09		-1.37	1.59E-09	***	4.23	-9.78E-09	***	-9.96
ADoth	-2.23E-09		-1.46	-2.63E-09	***	-5.52	5.02E-09	***	6.08
HHEDU1	0.045643	***	4.93	5.71E-04		0.53	-2.11E-03		-0.45

Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Chains	0.016492	***	3.35	0.012716	***	7.14	8.28E-03	**	2.60
HHINC	-7.81E-07	***	-4.42	-1.23E-08		-0.71	5.87E-07	***	6.94
T	-3.27E-03		-0.62	5.68E-04		0.70	0.01549	***	5.68
HHSIZE	-0.026709	***	-8.42	-1.14E-03	***	-3.36	0.017652	***	9.60
Mills	0.035866	**	3.15	0.07339	***	3.52	0.055955	***	9.78
Urban	0.047226	***	6.54	-2.21E-03	**	-1.97	0.011657	***	3.48
LM(-1)	0.070696	***	18.23	0.087882	***	3.35	0.042744	***	12.45

TABLE 5.8. Second-Step Working-Leser Demand Estimates for Alberta

	Co-op			Empire			Loblaws		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	0.043411		0.36	0.060867		0.48	2.24E-01	*	1.71
LTE	4.61E-03		0.92	7.21E-03		1.29	-2.99E-02	***	-4.91
Mills	0.045439	***	19.43	-7.33E-03	***	-3.30	1.11E-02	***	4.98
LM(-1)	0.021652	***	11.37	2.85E-03		1.53	1.11E-02	***	6.30
AD	2.66E-09		0.50	1.07E-09		0.31	1.69E-10		0.06
ADoth	1.62E-09		0.79	7.74E-10		0.35	-6.46E-10		-0.29
HHINC	-9.02E-08		-0.40	-3.84E-07	*	-1.70	3.36E-07		1.37
HHEDU1	0.027603	**	2.16	-0.032567	**	-2.01	0.038686	**	3.04
KID1	-0.039031	**	-2.25	-1.21E-02		-0.67	0.019088		1.01
HHSIZE	0.026764	***	4.01	7.30E-03		1.08	0.019427	**	2.85
T	-4.73E-03		-0.67	-2.84E-03		-0.38	0.013741	*	1.85
Chains	-0.031057	***	-6.95	0.016712	***	3.94	4.17E-03		0.88
	JPG			Safeway			Others		
Parameter	Coeff.		t	Coeff.		t	Coeff.		t
Constant	1.36E-01		1.39	4.24E-01	**	2.71	1.11E-01		1.33
LTE	-2.53E-02	***	-4.80	8.50E-02	***	12.24	-4.15E-02	***	-8.27
Mills	-1.47E-02	***	-6.51	1.88E-02	***	7.86	-0.053319	***	-24.56
LM(-1)	-5.15E-03	**	-2.22	0.021272	***	12.94	-0.051711	***	-19.83
AD	-5.40E-10		-0.17	-2.83E-09		-1.08	-5.33E-10		-0.33
ADoth	6.80E-10		0.41	-3.51E-09		-1.29	1.08E-09		0.73
HHINC	9.01E-08		0.49	-1.51E-07		-0.49	1.99E-07		1.35
HHEDU1	3.43E-02	***	3.89	-0.080747	***	-4.26	0.012714	*	1.64
KID1	0.027611	**	2.18	0.056311	**	2.74	-0.051892	***	-4.37
HHSIZE	-5.96E-03		-1.30	-0.077532	***	-10.03	0.030002	***	6.47
T	-2.08E-03		-0.33	-5.85E-03		-0.67	1.76E-03		0.37
Chains	9.86E-03	**	2.97	-3.66E-02	***	-6.63	0.036881	***	14.50

National and Store Brand Choice Analysis

Introduction

The third objective of the study is to identify how consumers make decisions about private label versus national branded meat products in their fully processed value-added meat category. The analysis aims to quantify the impact of price, advertising, demographic and regional characteristic differences in brand choice behaviour, and these differences in the behaviour across meat types. In this chapter, the data setup for the analysis is provided followed by the data descriptive statistics. Then the explanation of model specification and econometric methods is given. The model results and summary are finally provided in the final section of the chapter.

Data setup and descriptive statistics

Nielsen Homescan™ data is sourced for the 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 sectionr 4 and 5 was analysed in the brand choice analysis. The panel totalled 1036 households in Ontario and 508 households in Alberta in the balanced panel. Three fully processed meat types: pork, poultry, and other meat (mainly fish products) are used in the analysis, there was almost no shares of branded beef purchased, so beef was excluded in this analysis. In order to better understand the brand choice decisions, the national brands and private label products were grouped into four brand categories in detail according to their marketing shares, the four shares are the leading national branded products, other national branded products, the leading store branded products, and other store branded products. Then twelve choice alternatives in this analysis were identified: (1) leading national branded pork, poultry and others; (2) other national branded pork, poultry and others; (3) leading store branded pork, poultry and others; (4) other store branded pork, poultry and others. These product purchases were aggregated into annual expenditures by each household.

Table 6.1 Brand Categories

Brand Categories	Meat Types	Brands
Leading National Brands	Pork, Poultry, Others (Mainly Fish)	Schneider Maple Leaf Mitchells
	Other Meats (Mainly Fish)	High Liner
Other National Brands	Pork, Poultry, Others (Mainly Fish)	Fletchers Cooks Harvest Sterling Silver Anchor Grimms Burns Olympic Maple Birch Drake Olymel Vegreville Capital Packers Etc...
Leading Private Labels	Pork, Poultry, Others (Mainly Fish)	Presidents Choice No Name
Other Private Labels	Pork, Poultry, Others (Mainly Fish)	Safeway Select Butchers Cut Compliments Country Morning Western Family Etc...

Model specification and econometric method

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 analysis in the previous sections of this report. Due to the zero expenditure problem, not all households in Ontario and Alberta have positive expenditures on all twelve meat categories in every year. Each household is assumed to face 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).

Therefore a two-step estimation following the Heien and Wessels (1990) Working-Leser demand system procedure is applied in the brand choice demand analysis. In the first step, a probit regression is computed that determines 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 Working-Leser demand system

Participation decision for brand choice (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 variables $y_{iht} = 1$ 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 $E(y_{iht}) = 1 * p_{iht} + 0 * (1 - p_{iht}) = p_{iht}$, followed by same method as in Chapter 4 and 5, the brand choice participation decision is modeled as a function of household demographic variables and total meat consumption in all fully processed meat products..

So the likelihood of household brand choice decision $(\Pr[y_{iht} = 1])$ for a random effects panel 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 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

$$X_{iht}^t \beta = \beta_0 + \beta_1 * \text{Total} + \beta_2 * hhinc + \beta_3 * hage + \beta_4 * hages + \beta_5 * urban + \beta_6 * hhsize + \beta_7 * T$$

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 regression (SUR) of the expenditure share 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:

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

where *(i,j)* represents the twelve branded fully processed meat products;

wi is the expenditure share of meat product i among the twelve branded meat products;

pij is the price of branded meat product ij;

Mtotal is the total expenditure of all twelve fully processed meat products;

M(-1) is the lagged meat i expenditure which may lead to a habit formation, where past consumption decisions serve as predictors of future purchase decisions.

AD is the advertising information of a given branded meat i.

ADoth is the total of other branded meat advertising information.

HHINC is the household income.

Kid is the presence of children in the household.

Stores represents the number of grocery store chains where household purchage the twelve meat products.

T is the time trend variable.

Urban represents household reside in urban area

HHECU is the level of household head education;

Mills is the inverse mill ratios obtained from the fist Probit model estimations.

Model testing and empirical results

TSP International 5.0 was the econometric software used for the estimation of parameters in this study. Likelihood ratio tests (LRT) were applied to select the best fitting model among a number of models. Definitions of variables used for the analysis are listed below in Table 6.2.

Table 6.2 Definition and sample statistics of variables used for brand choice analysis

Variables	Definitions	Ontario		Alberta	
		Mean	SD	Mean	SD
First stage binary dependent variables					
D1NB0	1 if choose other NB pork, 0 otherwise	0.15	0.36	0.23	0.42
D1NB1	1 if choose leading NB pork, 0 otherwise	0.25	0.43	0.18	0.39
D1PL0	1 if choose other SB pork, 0 otherwise	0.05	0.23	0.11	0.31
D1PL1	1 if choose leading SB pork, 0 otherwise	0.09	0.29	0.05	0.22
D3NB0	1 if choose other NB poultry, 0 otherwise	0.25	0.43	0.21	0.41
D3NB1	1 if choose leading NB poultry, 0 otherwise	0.08	0.27	0.13	0.33
D3PL0	1 if choose other SB poultry, 0 otherwise	0.20	0.40	0.30	0.46
D3PL1	1 if choose leading SB poultry, 0 otherwise	0.34	0.47	0.11	0.32
D4NB0	1 if choose other NB other meats, 0 otherwise	0.41	0.49	0.44	0.50
D4NB1	1 if choose leading NB other meats, 0 otherwise	0.37	0.48	0.40	0.49
D4PL0	1 if choose other SB other meats, 0 otherwise	0.13	0.34	0.18	0.39
D4PL1	1 if choose leading SB other meats, 0 otherwise	0.31	0.46	0.12	0.32
Second stage expenditure share dependent variables					
S1NB0	expenditure share of other NB pork	0.05	0.16	0.08	0.21
S1NB1	expenditure share of leading NB pork	0.07	0.19	0.06	0.17

Variables	Definitions				
S1PL0	expenditure share of other SB pork	0.01	0.08	0.03	0.13
S1PL1	expenditure share of leading SB pork	0.02	0.09	0.02	0.09
S3NB0	expenditure share of other NB poultry	0.08	0.19	0.08	0.20
S3NB1	expenditure share of leading NB poultry	0.02	0.09	0.04	0.14
S3PL0	expenditure share of other SB poultry	0.06	0.17	0.12	0.24
S3PL1	expenditure share of leading SB poultry	0.13	0.25	0.04	0.14
S4NB0	expenditure share of other NB other meats	0.15	0.26	0.18	0.28
S4NB1	expenditure share of leading NB other meats	0.13	0.25	0.15	0.26
S4PL0	expenditure share of other SB other meats	0.03	0.12	0.05	0.15
S4PL1	expenditure share of leading SB other meats	0.11	0.22	0.04	0.14
Logged form of meat price					
LP1NB0	logged price of other NB pork	0.78	0.09	0.83	0.10
LP1NB1	logged price of leading NB pork	1.04	0.09	1.03	0.08
LP1SB0	logged price of other SB pork	0.74	0.05	0.74	0.05
LP1SB1	logged price of leading SB pork	0.88	0.13	0.73	0.05
LP3NB0	logged price of other NB poultry	0.96	0.08	0.89	0.12
LP3NB1	logged price of leading NB poultry	0.92	0.05	0.99	0.10
LP3SB0	logged price of other SB poultry	0.90	0.09	0.97	0.10
LP3SB1	logged price of leading SB poultry	0.97	0.08	0.92	0.07
LP4NB0	logged price of other NB other meats	0.99	0.12	1.08	0.20
LP4NB1	logged price of leading NB other meats	0.96	0.09	1.00	0.09
LP4SB0	logged price of other SB other meats	1.05	0.04	1.05	0.07
LP4SB1	logged price of leading SB other meats	1.07	0.12	1.08	0.08

		Ontario		Alberta	
Variables	**Definitions**	**Mean**	**SD**	**Mean**	**SD**
Advertisng expenditure by meat types					
AD1NB0	AD for other NB pork	856027	678112	856027	678169
AD1NB1	AD for leading NB pork	2020332	973264	2020332	973345
AD1PL1	AD for other SB pork	0	0	0	0
AD1PL0	AD for leading SB pork	751563	310674	751563	310700
AD3NB0	AD for other NB poultry	453368	325369	453368	325396
AD3NB1	AD for leading NB poultry	4300882	2055386	4300882	2055558
AD3PL0	AD for other SB poultry	261385	357791	261385	357820
AD3PL1	AD for leading SB poultry	142351	318332	142351	318359
AD4NB0	AD for other NB other meats	1504134	321012	1504134	321039
AD4NB1	AD for leading NB other meats	56927	126988	56927	126999
AD4PL0	AD for other SB other meats	104409	150071	104409	150084
AD4PL1	AD for leading SB other meats	2701	6041	2701	6041
HH demographic and purchase information					
T	year 1-6	3.50	1.71	3.50	1.71

HHSIZE	Number of members in household	2.40	1.21	2.34	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	12	53	12
HAGES	Squared household head age	3212	1281	3006	1272
HHINC	Annual HH income(C$, midpoint)	52386	22189	51932	21909
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	0.46	0.69	0.46
RURAL	1 if in rural area, 0 otherwise	0.32	0.46	0.31	0.46
TOTAL	Total expenditure on all types of meat	63.89	78.25	60.29	64.37
LTE	logged total exp on all types of meat	1.43	0.70	1.45	0.67
STORES	Number of grocery chains HH visited	0.83	1.08	1.62	1.02

Note: 1 .The source of data is Nielsen Homescan™ Panel, Ontario& Alberta, 2002-07)

2. NB=National Brands, SB=Store branded (or Private labels)

TABLE 6.3. First-Step Probit Estimates for Ontario

Variables	other NB pork			other NB poultry			other NB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t
C	-4.2394	***	-8.0	-0.8948	**	-2.5	-0.9633	**	-2.8
TOTAL	0.0023	***	8.9	0.0042	***	17.7	0.0046	***	18.7
HHINC	0.0000		-0.9	0.0000		-0.8	0.0000	*	-1.7
HAGE	0.0462	**	2.4	0.0096		0.7	-0.0077		-0.6
HAGES	-0.0003		-1.6	-0.0002	*	-1.9	0.0001		0.8
URBAN	-0.1221	**	-2.7	0.0990	**	2.4	-0.0442		-1.2
HHSIZE	0.1549	***	7.4	0.1166	***	6.9	0.1710	***	10.6
T	0.2793	***	19.8	-0.0445	***	-4.1	0.0757	***	7.6
Variables	leading NB pork			leading NB poultry			leading NB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t
C	-1.2639	***	-3.3	-1.2747	**	-2.7	0.3266		1.0
TOTAL	0.0031	***	13.5	0.0023	***	8.3	0.0042	***	18.0
HHINC	0.0000	***	3.7	0.0000	**	-3.0	0.0000	***	-5.8
HAGE	-0.0249	*	-1.7	0.0047		0.3	-0.0472	***	-3.7
HAGES	0.0003	**	2.5	-0.0001		-0.8	0.0005	***	4.1
URBAN	-0.1558	***	-4.0	-0.2979	***	-5.8	-0.0746	**	-2.0
HHSIZE	0.0070		0.4	0.1478	***	6.7	0.1207	***	7.5
T	0.1600	***	14.7	-0.0413	**	-2.8	0.0360	***	3.6
Variables	other SB pork			other SB poultry			other SB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t

	Coeff.		t	Coeff.		t	Coeff.		t
C	-4.2182	***	-5.7	-0.4990		-1.4	-1.6313	***	-3.9
TOTAL	0.0015	***	4.5	0.0028	***	12.3	0.0033	***	13.4
HHINC	0.0000	**	2.4	0.0000	***	-5.7	0.0000		0.7
HAGE	0.0485	*	1.8	-0.0040		-0.3	-0.0078		-0.5
HAGES	-0.0003		-1.3	-0.0001		-0.7	0.0001		0.5
URBAN	-0.1682	**	-2.9	-0.0773	*	-1.9	0.0862	*	1.9
HHSIZE	0.0431		1.6	0.1041	***	6.0	0.0571	**	2.9
T	0.1675	***	9.4	0.0084		0.8	0.0523	***	4.2

Variables	leading SB pork			leading SB poultry			leading SB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t
C	-2.9634	***	-5.6	-1.2775	***	-3.6	-2.0586	***	-5.6
TOTAL	0.0030	***	11.6	0.0081	***	27.6	0.0065	***	24.6
HHINC	0.0000	**	2.8	0.0000	*	1.8	0.0000	***	7.5
HAGE	0.0217		1.1	0.0286	**	2.1	0.0260	*	1.9
HAGES	-0.0001		-0.6	-0.0004	**	-2.9	-0.0002	*	-1.8
URBAN	-0.0785		-1.6	-0.0372		-1.0	-0.0033		-0.1
HHSIZE	0.0027		0.1	0.0730	***	4.3	-0.0061		-0.4
T	0.1077	***	7.5	-0.0949	***	-8.9	0.0160		1.5

TABLE 6.3. First-Step Probit Estimates for Alberta

Variables	other NB pork			other NB poultry			other NB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t
C	-0.07023		-0.2	-2.40342	***	-5.3	-1.3488	***	-3.5
TOTAL	3.51E-03	***	8.8	6.42E-03	***	15.4	7.38E-03	***	17.4
HHINC	2.62E-06	**	2.1	1.06E-06		0.8	1.45E-06		1.2
HAGE	-0.03071	*	-1.9	0.066061	***	3.7	0.023545		1.6
HAGES	3.57E-04	**	2.3	-6.72E-04	***	-3.9	-2.47E-04	*	-1.7
KID0	-0.04012		-0.6	-0.18918	**	-2.7	-0.21184	***	-3.2
URBAN	-0.34594	***	-6.3	-0.12008	**	-2.1	0.243327	***	4.6
HHEDU1	-0.34601	***	-4.6	-0.1232		-1.5	-0.15108	**	-2.1
T	0.018985		1.2	-0.02236		-1.4	0.083515	***	5.8

Variables	leading NB pork			leading NB poultry			leading NB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t
C	-1.42271	**	-3.2	-1.56135	**	-3.2	-0.58208		-1.5
TOTAL	3.42E-03	***	8.4	5.08E-03	***	11.8	4.98E-03	***	13.0
HHINC	9.47E-07		0.7	-2.90E-06	**	-2.0	-1.73E-06		-1.5
HAGE	-0.01426		-0.8	0.01197		0.6	9.74E-03		0.6
HAGES	2.22E-04		1.3	-1.26E-04		-0.7	-3.45E-05		-0.2
KID0	-0.02003		-0.3	-0.11249		-1.4	-0.19501	**	-3.0
URBAN	0.088473		1.5	-0.0775		-1.2	-0.1297	**	-2.5
HHEDU1	0.01614		0.2	0.046498		0.5	-0.08002		-1.1

Variables	other SB pork			other SB poultry			other SB other meats		
T	0.075644	***	4.6	0.010543		0.6	-3.74E-03		-0.3
	Coeff.		t	Coeff.		t	Coeff.		t
C	-3.39912	***	-5.2	0.391194		1.0	-1.57529	***	-3.6
TOTAL	4.12E-03	***	9.0	6.90E-03	***	17.2	4.82E-03	***	11.9
HHINC	-3.75E-07		-0.2	-2.39E-06	*	-1.9	4.95E-06	***	3.6
HAGE	0.05271	**	2.1	-0.02327		-1.5	-0.01171		-0.7
HAGES	-4.38E-04	*	-1.9	1.84E-04		1.2	1.52E-04		0.9
KID0	-0.08842		-1.0	-0.28286	***	-4.2	0.0131		0.2
URBAN	-0.16285	**	-2.4	0.084935		1.5	0.088345		1.5
HHEDU1	-0.32746	***	-3.6	-0.20883	**	-2.8	0.134998		1.5
T	0.212839	***	10.0	-0.06787	***	-4.5	0.0124		0.7

Variables	leading SB pork			leading SB poultry			leading SB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t
C	-3.01968	***	-4.0	-0.29479		-0.6	-1.47132	**	-3.0
TOTAL	2.72E-03	***	5.0	4.69E-03	***	10.5	4.32E-03	***	9.9
HHINC	4.31E-06	**	2.2	5.20E-06	***	3.2	6.19E-06	***	4.0
HAGE	0.032139		1.1	-0.03682	*	-1.9	-0.0194		-1.0
HAGES	-2.10E-04		-0.8	2.67E-04		1.4	1.68E-04		0.9
KID0	-0.40941	***	-4.0	-0.47451	***	-6.1	-0.09963		-1.2
URBAN	-0.05632		-0.7	0.011565		0.2	0.052786		0.8
HHEDU1	0.06364		0.5	-0.07519		-0.7	0.198169	*	1.9
T	0.04180	*	1.8	-2.28E-03		-0.1	7.10E-03		0.4

Results from the first stage of the national versus store brand model suggest that the decision to purchase any of the four branded products is significantly affected by demographic characteristics in both Ontario and Alberta. In Ontario higher levels of household income are associated with higher probabilities of purchasing leading national and store brands for pork, poultry and other meats and other store brands of pork and poultry. In Alberta, higher incomes are associated with higher probabilities of purchasing leading store brands for pork, poultry and other meats but reduced probabilities of purchasing other store brands of pork and poultry and leading national brands of poultry (possibly reflecting the regional importance of Lilydale as a poultry processor in Alberta). There are also differences in the trends by meat type – for example over time there is a higher probability to purchase all four brands of pork and other meats in Ontario but opposite signs for poultry products. In Alberta the trend variables over time suggest positive signs on the probability of purchasing leading national brand, leading store brand and

other store brand for pork but negative signs for leading store brand and other store brands for poultry.

TABLE6.4. Second-Step Working- Leser Model Estimates for Ontario

Variables	other NB pork			leading NB pork			other SB pork			leading SB pork		
	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
Constant	0.156296		0.886052	-1.11E-01		-0.5369	-0.202231		-0.786066	2.07E-01		1.3311
LTE	-0.028697	***	-11.5558	-2.46E-02	***	-8.90423	-4.54E-02	***	-26.3273	-5.66E-02	***	-27.6331
Mills	0.018714	**	3.13178	0.05205	***	11.2485	-1.60E-01	***	-36.8213	-2.67E-01	***	-30.5681
Stores	-1.14E-03		-0.776652	5.18E-03	**	2.96945	-1.50E-03		-1.15357	4.29E-03	**	2.50998
AD	-3.90E-08	**	-2.58271	1.45E-08		1.38038	2.23E-08		0.568126	-1.25E-06		-1.37201
Adoth	2.67E-08	***	4.7486	-9.92E-10		-0.374554	-4.68E-09		-1.35176	-8.61E-09	**	-2.88655
LP1NB0	-2.70E-01	**	-2.21283	2.67E-02		0.417099	3.21E-02		0.482369	1.00E-01		1.34645
LP1NB1	-5.13E-02		-0.986056	0.171559		1.14303	-1.33E-01	**	-2.15901	-2.67E-01	***	-5.75712
LP1SB0	0.117558		0.774746	-4.51E-02		-0.356042	0.561709	**	2.3419	2.11E-01	*	1.70071
LP1SB1	-3.50E-01	***	-4.23129	-5.31E-02		-0.876525	-3.13E-02		-0.579907	0.051161		0.928665
LP3NB0	8.60E-03		0.740099	1.65E-02		1.01137	-2.96E-02		-1.31603	-0.028107		-1.44159
LP3NB1	0.125056	***	3.24359	-7.20E-02	*	-1.95241	1.33E-02		0.266879	0.028443		0.522514
LP3SB0	-1.74E-02		-1.18557	0.036626	**	2.3251	3.63E-02	**	2.74419	2.65E-02		1.40591
LP3SB1	-8.67E-03		-0.604301	4.69E-03		0.318124	0.033657	*	1.83063	4.41E-02	**	2.1528
LP4NB0	-7.54E-03		-0.694985	-4.81E-03		-0.430792	-0.023366		-1.42115	7.65E-04		0.047136
LP4NB1	1.28E-02		0.943018	3.42E-02	**	2.06215	4.08E-02	**	2.99886	0.04359	**	2.23579
LP4SB0	4.77E-02	*	1.80721	-1.18E-03		-0.043858	-8.04E-02	**	-1.99233	-0.100991	**	-1.99095
LP4SB1	-0.019836	*	-1.67962	0.015534		1.34809	-3.24E-02	**	-2.40542	-0.029877	*	-1.73087
KID1	-1.53E-02	**	-2.75579	-0.012906	**	-2.11271	5.30E-03		1.1399	-5.51E-03		-1.03906
hhinc	-1.46E-07		-1.49811	1.29E-07		1.16353	1.63E-07	**	2.42384	1.99E-07	**	2.36308
hhsize	1.14E-02	***	4.89671	-3.08E-03		-1.30334	-4.35E-03	**	-2.69671	-1.62E-03		-0.860263
T	2.52E-03		0.360814	2.79E-02	**	2.66131	0.019551		1.56947	-9.97E-05		-0.021873
urban	-9.21E-03	**	-2.18713	-1.21E-02	**	-2.62213	-1.50E-03		-0.522537	-1.41E-03		-0.378512
hage	2.18E-04		0.198692	-2.66E-03	*	-1.83185	7.41E-04		0.784209	2.27E-04		0.19374
hages	9.24E-06		0.840515	3.33E-05	**	2.40311	-4.97E-06		-0.558632	-2.94E-06		-0.267114
Variables	other NB poultry			leading NB poultry			other SB poultry			leading SB poultry		
	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
Constant	2.07E-01		1.14709	7.55E-01	***	3.33372	0.41254	**	2.30453	1.94E-01		1.04857
LTE	2.17E-02	***	7.98362	-2.30E-02	***	-12.5858	-6.79E-03	**	-2.7959	0.085279	***	22.7954
Mills	0.064153	***	14.4563	-4.75E-02	***	-5.64562	5.07E-02	***	10.0254	5.74E-02	***	13.263
Stores	1.90E-03		0.963497	4.81E-03	***	3.57003	5.00E-03	**	3.06896	-1.46E-02	***	-6.47299

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Variables	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
AD	4.03E-09		0.424116	2.47E-09		0.926036	-1.05E-10		-9.14E-03	7.55E-08	*	1.7485
Adoth	-9.62E-10		-0.323369	-1.03E-08	***	-3.80005	4.54E-09		1.5275	1.30E-08	**	3.16308
LP1NB0	8.24E-02		1.46999	1.38E-01	**	3.16427	-0.047786		-1.06034	-1.62E-01	**	-2.04221
LP1NB1	0.026875		0.425874	-0.118916	**	-2.10996	9.38E-02	*	1.79407	-1.26E-01	*	-1.73778
LP1SB0	-1.38E-01		-1.16026	-9.14E-02		-0.726391	0.17558		1.26974	-3.02E-01	**	-2.61556
LP1SB1	5.63E-02		0.953269	0.060486	*	1.74779	-5.40E-02		-1.08298	-0.169112	**	-2.01175
LP3NB0	-1.57E-01	**	-2.87579	2.58E-02		1.63127	1.00E-02		0.527297	0.078315	**	2.84673
LP3NB1	0.022586		0.410672	-4.54E-01	***	-3.35136	-1.33E-01	**	-2.95264	1.45E-01	**	2.39224
LP3SB0	0.028583		1.296	-0.015355		-1.03092	-1.67E-01	***	-3.44895	1.44E-02		0.559181
LP3SB1	-2.84E-04		-0.013568	-7.19E-04		-0.044516	2.93E-03		0.174608	-7.07E-03		-0.143768
LP4NB0	-3.74E-02	**	-2.473	-8.46E-03		-0.967033	-0.02379	**	-1.97645	8.02E-03		0.4562
LP4NB1	-1.59E-02		-0.777522	8.58E-03		0.666689	-0.069944	***	-3.82497	5.11E-02	**	2.03012
LP4SB0	-0.016543		-0.446913	-5.00E-02	*	-1.66089	-1.17E-01	**	-2.71454	0.161895	***	3.40774
LP4SB1	-7.41E-04		-0.051926	-8.16E-03		-0.836221	2.56E-02	**	2.8556	-1.19E-01	***	-5.02421
KID1	8.39E-03		1.05232	7.65E-05		0.015882	-7.27E-04		-0.107259	3.57E-03		0.332447
hhinc	2.52E-08		0.257223	-1.11E-07		-1.56271	-2.93E-07	**	-3.13646	2.63E-07	*	1.92552
hhsize	2.66E-03		1.01648	3.10E-03	*	1.79789	-1.66E-03		-0.700944	3.12E-03		0.867383
T	-0.010136	**	-2.02325	-2.79E-02	***	-3.35665	2.84E-03		0.458417	-0.033387	***	-5.98143
urban	1.96E-02	***	4.75842	-0.010748	***	-3.30461	-3.05E-03		-0.758334	-2.85E-03		-0.511675
hage	1.84E-03		1.04192	-1.44E-03		-1.05922	-1.34E-03		-0.822587	5.49E-03	**	2.66911
hages	-3.18E-05	**	-1.998	9.18E-06		0.737236	-5.72E-07		-0.038775	-6.53E-05	***	-3.4885

Variables	other NB other meats		leading NB other meats		other SB other meats		leading SB other meats	
	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
Constant	1.79E-01	0.849819	7.09E-02	0.368926	0.090033	0.565486	-0.958398 ***	-5.08049
LTE	2.21E-02 ***	5.8303	7.70E-03 **	2.07536	-6.52E-03 ***	-3.52342	0.054737 ***	16.4427
Mills	7.30E-02 ***	17.6335	6.34E-02 ***	15.3432	0.016579 **	2.93222	0.0785 ***	18.0504
Stores	1.38E-03	0.523638	9.37E-03 ***	3.74748	-2.71E-03 **	-2.14878	-0.011935 ***	-6.4501
AD	-1.75E-08	-1.41404	-3.45E-08	-1.0478	3.08E-08	0.760206	1.19E-06	1.30863
Adoth	-9.12E-09 **	-2.77559	-7.59E-09 **	-1.97362	2.57E-09	1.13176	-4.48E-09 *	-1.72503
LP1NB0	1.28E-01	1.51079	0.195965 **	2.35046	-0.159734 ***	-3.87504	0.14358 ***	3.43034
LP1NB1	-4.48E-02	-0.637609	-0.041057	-0.58852	-0.077522	-1.38543	0.140251 **	2.0124
LP1SB0	-3.78E-02	-0.309324	0.067172	0.514654	0.023639	0.160373	0.095697	1.05704
LP1SB1	1.17E-01 *	1.79288	0.159074 **	2.35628	-0.053981	-1.4478	0.045682	0.310547
LP3NB0	-1.94E-02	-0.719337	-7.03E-03	-0.270001	-0.012172	-0.88022	0.136917 **	1.98271
LP3NB1	4.55E-03	7.07E-02	3.48E-03	0.057505	0.021589	0.607809	0.037478 *	1.7834
LP3SB0	0.032378	1.30656	-0.05079 *	-1.87145	0.036265 **	3.04358	0.081417 **	2.11547
LP3SB1	-9.87E-02 ***	-3.65982	0.02194	0.857647	-0.012917	-1.2765	0.013481	0.762626
LP4NB0	5.39E-02	1.25014	-4.61E-03	-0.26029	4.67E-03	0.531255	0.093319 ***	3.64847
LP4NB1	-5.53E-02 **	-2.06196	-0.090344 *	-1.80788	-7.56E-03	-0.728872	0.019905	1.29383
LP4SB0	-0.065658	-1.23263	0.068791	1.62974	0.164313 *	1.85723	0.034572 *	1.87223
LP4SB1	4.62E-02 **	2.53003	0.011245	0.629645	-0.016098 *	-1.82702	0.062291 *	1.66999
KID1	1.72E-02 *	1.81E+00	9.12E-04	0.104611	-0.011707 **	-2.86966	0.010683	1.32281
hhinc	-1.89E-07	-1.26102	-1.26E-06 ***	-8.18267	2.21E-07 **	3.12845	1.00E-06 ***	8.12903

	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
hhsize	6.86E-03	**	1.96949	-3.08E-04		-0.089183	-8.56E-04		-0.564419	-0.015297	***	-5.54968
T	6.97E-03		1.22645	3.98E-03		0.696324	-1.37E-03		-0.236554	9.14E-03		1.438
urban	2.40E-03		0.383786	5.19E-03		0.842611	6.00E-03	**	2.12371	7.69E-03		1.59093
hage	-1.61E-03		-0.809765	-5.58E-03	**	-3.00747	-1.16E-03		-0.963125	5.28E-03	**	2.97875
hages	2.31E-05		1.22042	6.75E-05	***	3.79092	1.08E-05		0.979924	-4.77E-05	**	-2.91179

TABLE 6.5 Second-Step Working- Leser Model Estimates for Alberta

Variables	other NB pork			leading NB pork			other SB pork			leading SB pork		
	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
Constant	1.28003		1.34232	0.559658		0.741768	-0.56249		-0.824574	-0.054502		-0.094016
LTE	-0.018325	***	-3.97456	-9.13E-03	*	-1.86932	-0.092911	***	-16.6405	-0.064616	***	-16.0256
Mills	0.071523	***	9.69711	0.052721	***	7.22627	-0.352478	***	-23.2035	-0.18476	***	-30.4135
Stores	2.74E-03		0.7633	1.60E-03		0.473588	0.014118	***	3.61448	5.94E-03	**	2.10349
AD	-9.12E-09		-0.426896	-2.00E-08		-0.99817	8.14E-09		0.131748	5.15E-06	*	1.79427
Adoth	9.29E-10		0.152556	-4.29E-09	*	-1.77287	1.88E-09		0.399104	-2.52E-09		-1.24652
LP1NB0	-0.021544		-0.217877	0.018755		0.448584	8.38E-03		0.135165	0.027918		0.746685
LP1NB1	-0.084029		-0.991161	-0.205058		-1.0701	-0.130394		-1.27595	-0.183048	**	-2.70858
LP1SB0	-0.62313		-0.551188	-0.928064		-0.901098	-0.431081		-0.59296	-0.290374		-0.305317
LP1SB1	-0.51597		-0.563093	0.739631		0.661444	1.15669		1.12245	0.670415		0.891583
LP3NB0	6.43E-03		0.438556	0.011418		0.882269	-0.018981		-0.772841	-5.02E-03		-0.320257
LP3NB1	3.52E-03		0.375289	0.019981	**	2.02369	8.41E-03		0.486331	0.011745		0.919566
LP3SB0	-2.24E-03		-0.103552	-0.020189		-0.703032	0.072319	**	2.63138	0.03508	*	1.78192
LP3SB1	0.013189		0.548806	0.018882		1.51534	0.034674		0.707669	-2.62E-03		-0.102538
LP4NB0	-4.20E-03		-0.252298	1.66E-03		0.111602	0.011419		0.62919	0.014514		1.2516
LP4NB1	-0.020418		-0.810564	-0.031973		-1.50516	0.106679	***	3.5168	8.94E-03		0.394482
LP4SB0	0.012251		0.264015	0.017615		0.669534	0.076176		1.21087	-0.013696		-0.373873
LP4SB1	0.012163		0.508719	0.040888	**	2.59348	-0.172509	**	-2.07235	-0.055532		-1.54403
KID1	-0.038666	***	-3.41149	3.20E-03		0.381543	-0.032084	**	-3.17077	-3.45E-03		-0.454866
hhinc	-1.06E-07		-0.69515	1.30E-07		0.952741	-1.18E-07		-0.783922	7.37E-08		0.688618
hhsize	0.016241	***	3.6176	-8.05E-03	**	-2.62699	9.18E-03	**	2.4568	3.94E-03		1.44287
T	-0.041338		-1.22268	-0.010267		-0.40903	0.033828		1.43604	9.08E-03		0.456529
urban	-0.052367	***	-6.63482	8.90E-03		1.59492	-4.58E-03		-0.716492	4.76E-03		1.07782
hage	-5.13E-03	**	-2.52364	-4.77E-03	**	-2.58672	1.86E-03		1.28319	1.08E-03		0.97804
hages	5.87E-05	**	2.99793	5.31E-05	**	2.98159	-1.68E-05		-1.13434	-8.78E-06		-0.805175
Variables	other NB poultry			leading NB poultry			other SB poultry			leading SB poultry		
	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
Constant	0.686861		0.768059	-0.527666		-1.13042	-0.382855		-0.448735	-0.530283		-0.788184

Variables	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
LTE	0.011254	*	1.78377	5.39E-03		1.23828	0.083139	***	11.0568	7.03E-03		1.42483
Mills	0.055397	***	7.06554	0.019822	**	2.1286	0.081321	***	13.3048	0.016286	*	1.65752
Stores	0.011434	**	2.64768	-1.45E-03		-0.449554	-0.021776	***	-4.68378	-7.44E-03	**	-2.02351
AD	5.35E-09		0.260958	-7.69E-10		-0.394145	-1.35E-08		-0.751601	-2.16E-09		-0.15837
Adoth	4.13E-10		0.163463	5.09E-09		1.48545	4.49E-09	*	1.908	4.18E-09	**	2.14909
LP1NB0	-0.057707		-1.23462	-0.01344		-0.587392	0.116593	**	2.30692	0.021514		0.567457
LP1NB1	0.027768		0.325639	0.184601	***	3.35765	0.120422		1.08889	0.094508		1.38473
LP1SB0	-1.13646	*	-1.85969	-1.03732		-1.27486	-0.353215		-0.42989	1.0039		0.838602
LP1SB1	0.322642		0.344612	1.43271	**	2.39494	1.13719		1.42734	0.146585		0.182125
LP3NB0	-0.123994	*	-1.92965	3.45E-03		0.200754	-0.057973		-1.19773	-0.015428		-0.813113
LP3NB1	-0.01221		-0.459261	-6.07E-03		-0.190496	-0.060319		-0.96845	-4.16E-03		-0.407403
LP3SB0	-0.037782		-1.37028	0.020592		1.35923	-0.09483		-1.56566	0.040127	**	2.93135
LP3SB1	0.076521	**	3.04156	-6.15E-04		-0.04717	0.028793		0.955955	-0.215219	*	-1.75533
LP4NB0	-0.012875		-0.509705	-4.02E-03		-0.464776	-0.044727	**	-2.30618	-0.030243	**	-2.69831
LP4NB1	-6.88E-03		-0.25477	5.25E-03		0.295378	-0.097922	**	-3.07147	-0.020032		-0.908903
LP4SB0	8.77E-03		0.277807	6.04E-03		0.217464	-0.024116		-0.541763	0.068819	**	2.57828
LP4SB1	-0.015885		-0.464979	-0.017986		-0.847737	0.036131		0.991219	-0.211901	***	-4.30584
KID1	-0.028896	**	-2.24337	-5.93E-03		-0.707068	0.033803	**	2.80835	0.020719	**	2.06837
hhinc	-4.51E-08		-0.290258	-3.03E-07	**	-2.63888	-6.92E-07	***	-3.67887	3.65E-07	***	3.19629
hhsize	0.012741	**	2.83088	1.86E-03		0.633678	-5.93E-03		-1.31296	5.55E-04		0.162996
T	-0.025298		-0.815066	0.026355	*	1.65208	0.013771		0.444177	0.031823		1.44814
urban	-0.02056	**	-2.84346	-1.37E-04		-0.028232	0.014087	**	1.97602	7.86E-03	*	1.68296
hage	7.98E-03	***	4.22537	-2.45E-04		-0.176594	-4.12E-03	*	-1.74424	-6.28E-03	**	-2.95352
hages	-8.52E-05	***	-4.63214	-1.14E-06		-0.088197	3.06E-05		1.35515	4.87E-05	**	2.56462

Variables	other NB other meats			leading NB other meats			other SB other meats			leading SB other meats		
	Coeff.		t	Coeff.		t	Coeff.		t	Coeff.		t
Constant	-0.156294		-0.159711	-1.3449		-1.27449	-0.795542		-1.03778	2.82799	*	1.91429
LTE	0.066183	***	8.48493	0.011603	*	1.64315	7.14E-03		1.5403	-6.76E-03		-1.37189
Mills	0.090854	***	15.6391	0.078915	***	13.6173	0.046411	***	6.53357	0.023989	**	2.35765
Stores	-2.07E-03		-0.406299	2.71E-03		0.588412	-4.70E-03		-1.50391	-1.10E-03		-0.316523
AD	9.87E-09		0.494596	6.42E-08		1.51434	-1.96E-08		-0.107168	-5.17E-06	*	-1.88117
Adoth	-1.24E-09		-0.318153	4.18E-09		1.25503	3.63E-09		1.10853	-1.67E-08	*	-1.92308
LP1NB0	0.020894		0.366912	-0.062607		-1.3664	8.96E-03		0.305005	0.037239		0.408692
LP1NB1	-0.136134		-1.34336	0.188058	**	2.06804	-0.113882		-1.58903	-0.0708	**	-2.22687
LP1SB0	1.12493		0.756751	2.59839		1.2283	3.65948	**	2.09252	-3.32E-03		-0.054559
LP1SB1	-1.22245		-1.02532	-1.40773		-0.948252	-2.54112		-1.20968	0.48323		0.531677
LP3NB0	0.012668		0.489808	0.046931	**	2.29941	0.032557	**	2.42827	-3.7209	**	-2.1514
LP3NB1	-0.027666		-0.432344	0.010173		0.728603	-9.69E-03		-0.638882	-0.010461		-0.768404
LP3SB0	-0.030977		-0.586749	0.052251	**	1.96212	-7.95E-03		-0.25778	0.011357		1.44487
LP3SB1	0.042904		1.34821	-0.060976	**	-2.1788	0.010099		0.472011	-0.017612		-0.616148
LP4NB0	0.175401	***	5.80239	-0.055411	**	-2.64249	-2.28E-03		-0.213344	0.080376		1.4647
LP4NB1	-0.086119	**	-2.14809	0.31157	***	4.82299	0.025882		1.20564	5.09E-04		0.055206
LP4SB0	8.64E-04		0.016089	-7.60E-03		-0.133533	-0.096824		-1.4377	-0.018356		-0.920359

LP4SB1	0.110919	**	2.57537	-0.012606		-0.326468	0.018004		0.794163	0.070575	**	2.54291
KID1	0.025532	*	1.76999	0.048547	***	3.62426	-0.019784	**	-2.04856	-2.99E-03		-0.31916
hhinc	8.76E-09		0.039032	4.30E-08		0.207515	2.65E-07	**	2.35333	3.79E-07	**	3.14547
hhsize	-0.011489	**	-2.11547	-0.01855	***	-3.85427	4.00E-03		1.08626	-4.50E-03		-1.30744
T	7.40E-03		0.225631	0.028902		0.823592	0.023588		1.08819	-0.097841	**	-1.99229
urban	0.062721	***	7.27548	-0.034438	***	-3.82502	7.63E-03		1.48077	6.14E-03		1.29001
hage	6.81E-03	**	2.78231	8.43E-04		0.363065	4.83E-04		0.365876	1.48E-03		1.15394
hages	-6.53E-05	**	-2.73736	8.64E-06		0.374081	-3.93E-06		-0.299018	-1.85E-05		-1.46706

The estimated results for Ontario and Alberta in the second stage model which establish the impact of demographic and other characteristics on the level of spending for pork, poultry and other meats classified by leading national brand, other national brands, leading store brand, other store brands also highlights differences between the provinces. For one variable, the number of stores visited by each household, there is a strong positive relationship between number of stores and level of spending on the leading national brand of pork poultry and other meats in Ontario. The same is not true in Alberta. This suggests that in Ontario the shopper is more 'loyal' to the leading national brand regardless of store choice. In Ontario higher income levels are associated with higher expenditures for leading national and other store brands for all pork, poultry and other meats with the exception of other store brand poultry products. In Alberta higher incomes are only associated with higher spending on leading store brand poultry and other meats and other store brands of other meats. Over time there is a positive increase in sales of the leading national brand of pork but declining sales of the leading national brand of poultry products in Ontario. In Alberta, there is only a small positive increase in the leading national brand of poultry that is statistically significant out of all of the twelve types of product. In Ontario households with older heads have lower expenditures on the leading national brand for pork and other meats and higher expenditures on the leading store brands for poultry and other meats. In Alberta, households with older heads have lower expenditures on the leading national brand and other national brands of pork, higher expenditures on other national brands of poultry but lower expenditures on leading and other store brands of poultry and higher expenditures on other national brands of other meats.

Summary and Conclusions

The overall objective of the study is to look at the structure of consumer value added meat purchasing behaviour (value added meat type choices, store choices as well as brand choices) in order to improve the understanding of recent food-at-home consumption patterns and discern new trends in value-added meat demand.

Specifically the research objectives for the study are threefold:

1. Using household level meat purchase data over the period 2002-2007 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 (fish, lamb, etc)
    b. Quantify the impact of demographic and regional characteristics differences on meat consumption behaviour, and these differences in the behaviour across meat types.

2. Using household level meat purchase data from 2002-2007 and store level advertising data(1999-2006) in order to:
    a. Find out whether Canadian consumers show consistency in meat purchasing patterns by store. Are they loyal to particular stores? Does this vary by region, by demographics, by store availability, is store advertising a factor?

3. Use household level purchase data from 2002-2008 and Nielsen Media Measurement's advertising data(2000-2008) in order to:
    a. Identify how consumers make the decisions about private label versus national brand products in their fully processed value-added meat category. Is product and brand advertising a factor? Does behaviour vary regionally and by demographics?

The aim of all of these individual analyses is to determine whether or not there are characteristics of meat purchasing – by animal species, by level of processing, by store and by branding which could enhance understanding of the potential success of value adding strategies. Future value-added meat product development might be enhanced by understanding whether there are significant differences across any of these descriptors.

The analysis was conducted for two subsets of the national Nielsen Homescan™ panel meat purchasing data . First of all households were selected with the aim of having as long a purchase history as possible – allowing the analysis of habit formation and trend as significant determinants of household purchasing behaviour. For the existing data this resulted in selecting households who were part of the Nielsen panel over the period 2002 to 2007/2008. As well rather than analyze the entire national panel, households who were from Ontario and Alberta were selected for further analysis. This resulted in the reduction of the panel to maneageable numbers for analysis and allowed the comparison of two very different regions within the country. These two regions were of interest due to the size of Ontario (largest provincial population) and the fact that Alberta is so significant in livestock production but has not traditionally been as significant in value –added meat processing.

Summary

Using a relatively arbitrary method of describing individual meat products, meats divided into four major types (pork, beef, poultry and other) were further divided into three main levels of processing. The first and largest category is fresh meat purchases (on every measure the majority of meat purchased through grocery stores by Canadians continues to be in fresh form) ranging from approximately 70% of meat expenditures in Ontario to 75% plus of total meat expenditures in Alberta. Semi-processed meats were classified as those to which some level of further processing had been applied (sauces, flavourings, for example) but for which cooking would still be required by the purchaser. In Ontario this category represents 11% of meat ependitures while in Alberta it only represents 6% of meat expenditures on average. The final category was classified as fully processed which in some cases means no further cooking is required (ham, for example) but in other cases implies that the product has had more than one type of processing applied (breaded formed chicken nuggets, for example)

although cooking is still required. Meal type items would be included in fully processed. In Ontario fully processed meats make up over 20% of meat expenditures while in Alberta they average 19% of meat expenditures. By animal species, pork expenditures range from 20 – 25% in Alberta but 20-22% in Ontario over the period 2002 – 2007. Beef remains the dominant meat ranging from 32-38% in Alberta and from 30-33% of total meat expenditure in Ontario. Poultry expenditures range from 29-32% in Alberta over the period 2002-2007 while in Ontario they level of expenditure is more consistently 33-34% over the same period. In each province semi and fully processed beef expenditures are the smallest of the twelve meat types, reflecting the lower number of semi and fully processed beef products available in the market. In the final analysis of this report – the comparison between national branded and store branded products beef was excluded as a category due to the infrequency of purchases by households in Ontario and Alberta.

Three models are reported in this study – in each case the models are represented by a two stage structure. In the first stage (of each of the three models) the probability that a household makes a purchase decision (model 1 – to purchase a particular one of twelve types of meat including fresh, semi-processed and fully-processed beef, pork, poultry and other meat, model 2- to purchase meat at a particular grocery store chain, model 3 to purchase national brand or private label brand pork, poultry or other meat) is modelled as a function of demographic variables using a probit model. In the second stage expenditure shares are modelled as functions of demographic variables, trend, habit formation, where possible average market prices and advertising expenditures and the inverse Mills ratio from the first stage of the model. The results suggest indicators of the actual decision to purchase as distinct from the factors affecting the levels of expenditure on meat types in each model.

Consumer Meat Behaviour and Level of Processing

Estimates can be summarized in terms of sign and significance across the two decisions that are modelled. The first decision which is portrayed below is for the decision of whether or not to purchase each of the twelve fresh, semi-processed and fully processed meat products. In general, household headed by an older person are more likely to purchase all types of pork and fresh and

fully processed beef but less likely to purchase semi and fully processed poultry products. Higher levels of education are associated with higher probabilities of purchasing pork products in Ontario and poultry products in both provinces. As household sizes increase there is a greater probability of purchasing semi and fully processed meat products. Over time higher levels of processing have a higher probability of being selected.

Model 1 – Consumer Behaviour and Level of Processing – first stage decision

Variable	Pork Fresh		Pork Semi		Pork Fully		Beef Fresh		Beef Semi		Beef Fully		Poultry Fresh		Poultry Semi		Poultry Fully		Other Fresh		Other Semi		Other Fully	
	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 Exp	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
age	+	+	+	+	+	+	+	+		+	+	+	+		-	+	-	+	+					
educ	+		+		+	+				+	-	+			+	+	+	+			+		-	+
urban	-		-	-	-	-	+	+	-		-		+		-		-		+					-
hsize			+		+		-	+			+		-		+		+		+	+	+		+	+
time		-	+	+	+	+		-	+	-		+	+		+	+	-	+		+	+	+	+	+

In terms of factors which explain the level of expenditure on each of the twelve meat types the the consistent explanators appear to be the household size and/or having children in the household (in both provinces). Price responses, when statistically significant, suggest inelastic demands for most of the twelve meat types in both provinces (a 1% decrease (increase) in price results in a less than one percent increase (decrease) in quantity sold). Advertising effects do not appear to be significant across the twelve meat types in explaining the level of meat expenditure. Households with children are likely to spend less on semi and fully processed pork and beef but likely to spend more on fully processed poultry products. In Ontario households with higher levels of income are likely to spend less on all types of pork, on fresh and semi-processed beef but more on all types of poultry and fresh and semi-processed other meat products. In Alberta the effects of income are negative for fresh pork and beef but positive for all types of poultry products.

Consumer Meat Behaviour and Store Selection

It is worth stating that the vast majority of households do not choose to purchase their meat regularly at the same grocery store. Most households in the Nielsen panel purchase meat at more than one store and can purchase meat at up to 5 stores on a somewhat regular basis. In Ontario, households who spend more on meat have a higher probability of shopping at Empire, Loblaws, Metro and less likely to shop at 'other' grocery stores. Higher incomes, older household head age and larger household size result in a higher probability of shopping at a Loblaws store (including all stores owned by Loblaws). Over time more households are choosing to purchase meat at Metro, Empire and other grocery stores, in Ontario. Households in urban areas have a lower probability of shopping at Empire, Loblaws but a higher probability of shopping at Metro and other grocery stores. In comparison, in Alberta, households who spend more on meat are more likely to spend that money at Co-op, Empire, Loblaws and Safeway grocery stores (reflecting the increasing concentration in the grocery retailing industry in Canada). Urban dwellers are less likely to buy meat at Co-op, Empire, Loblaws but more likely to make meat purchases at JPG and Safeway. Larger household size suggests an increased probability of purchasing meat at Co-op, Empire, Loblaws and other grocery stores. In Alberta higher income households are more likely to make meat purchases

at Loblaws, JPG and other grocery stores and less likely to make meat purchases at Co-op stores. Over time probability of purchasing meat is growing at Empire, Loblaws and other grocery stores and declining at Safeway stores.

The significant explanatory variables for the decision on level of spending on meat at each of the grocery store chains are also variable across provinces. The number of grocery store chains shopped at by a household is a significant determinant of level of meat spending at all chains except Loblaws in Ontario. In Alberta the number of chains shopped at is positively related to the level of spending at Empire, JPG and other stores but is negatively related to the level of spending at Safeway and Loblaws brand stores. In Alberta, households with higher levels of education spend more on meat at Co-op, Loblaws and JPG and less at Empire and Safeway. In Ontario households with higher levels of education spend more on meat at Metro and less at Empire. Households with larger sizes spend more on meat at Loblaws and other stores in Ontario and at Co-op, Loblaws and others in Alberta. Store advertising has no significant effects in Alberta but has small positive effects on meat spending for Co-op and Safeway stores in Ontario – both non-traditional and small retailers in Ontario.

Consumer Behaviour and Choice of National Brand versus Private Label Meat Products

Results from the first stage of the national versus store brand model suggest that the decision to purchase any of the four (leading national brand, other national brands, leading store brand, other store brands) branded products is significantly affected by demographic characteristics in both Ontario and Alberta. In Ontario higher levels of household income are associated with higher probabilities of purchasing leading national and store brands for pork, poultry and other meats and other store brands of pork and poultry. In Alberta, higher incomes are associated with higher probabilities of purchasing leading store brands for pork, poultry and other meats but reduced probabilities of purchasing other store brands of pork and poultry and leading national brands of poultry (possibly reflecting the regional importance of Lilydale as a poultry processor in Alberta). There are also differences in the trends by meat type – for example over time there is a higher probability to purchase all four brands of pork and other meats in Ontario but opposite signs for poultry products. In Alberta the trend variables over time suggest positive signs on the

probability of purchasing leading national brand, leading store brand and other store brands for pork but negative signs for leading store brand and other store brands for poultry.

The estimated results for Ontario and Alberta in the second stage model which establish the impact of demographic and other characteristics on the level of spending for pork, poultry and other meats classified by leading national brand, other national brands, leading store brand, other store brands also highlights differences between the provinces. There is a strong positive relationship between number of stores and level of spending on the leading national brand of pork poultry and other meats in Ontario. The same is not true in Alberta. This suggests that in Ontario the shopper is more 'loyal' to the leading national brand regardless of store choice. In Ontario higher income levels are associated with higher expenditures for leading national and other store brands for all pork, poultry and other meats with the exception of other store brand poultry products. In Alberta higher incomes are only associated with higher spending on leading store brand poultry and other meats and other store brands of other meats. Over time there is a positive increase in sales of the leading national brand of pork but declining sales of the leading national brand of poultry products in Ontario. In Alberta, there is only a small positive increase in the leading national brand of poultry that is statistically significant out of all of the twelve types of product. In Ontario households with older heads have lower expenditures on the leading national brand for pork and other meats and higher expenditures on the leading store brands for poultry and other meats. In Alberta, households with older heads have lower expenditures on the leading national brand and other national brands of pork, higher expenditures on other national brands of poultry but lower expenditures on leading and other store brands of poultry and higher expenditures on other national brands of other meats.

Conclusion

At a household level there is significant variability in the markets for meat products, by species and by level of processing. There are significant demographic differences in household purchases of meat by grocery store chain across provinces. By products from different animal specieis the market for fully processed meat products is also variable across provinces and by demographic characteristic. It is clear from the results presented that there is no one correct pattern of value added meat product development across animal products from different species. To a certain extent the results presented are generated by the products available in the marketplace. There are clearly much higher numbers of pork and poultry semi-processed and fully processed products available than there are for beef. However the types of further processed products available in the pork and poultry areas are different either in their nature or in their uptake by consuming households. For example, in certain models households with children were less likely to purchase fully processed pork and beef but more likely to purchase poultry fully processed products.

Grocery store meat purchases exhibit little store loyalty – most households purchase meat at more than one store. In terms of meat product development the ability to reach a significant number of Canadian consumers is thus attached to the necessity to market through more than one grocery chain. Loblaws is one store chain with national reach that seems to be attractive to certain demographics – with older household heads, with higher incomes and larger household sizes in Ontario, for example. The determinants of meat spending at grocery stores in Alberta is more evenly divided across Co-op, Safeway, Empire and Loblaws, possibly due to traditional store availability in Canada. This significantly increases the logistical difficulties of developing new value-added meat products and delivering them to consumers in Canada.

Consumers also differ considerably in their interest in and level of spending on national brand and private label products. For some meat products store brand or private label products seem to be 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. Higher income households seem to prefer both national and store brands of meat products in both provinces. An interesting result in Ontario is the result that households who purchase meat at more stores seem to have higher expenditures on national

brands of pork, poultry and other meats, implying that even if they don't have store loyalty they may have national brand loyalty.

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