Public Preferences for Quota Buybacks in the Context of Canadian Supply Management Deregulation

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Abstract

This project examines supply management deregulation from a public preference perspective. It utilizes data collected in a nationally representative survey of Canadian adults conducted between December 2018 and January 2019. From the survey it was observed that 20 percent of respondents opposed paying producers compensation for the lost value of quota if supply management were to be removed, however the remaining 80 percent selected either partial compensation (57 percent) or full market value compensation (23 percent). To better understand the determinants of support, a random utility model was estimated using ordinal logistic regression, with the level of compensation as a function of personal and household characteristics, food purchasing habits, and a range of policy preferences. The survey also contained an experiment examining the effects of additional information about consumer costs and distributional implications of supply management on preferences for quota value compensation. The probability of selecting higher levels of compensation were found to increase when cost information was provided, but the level of preferred compensation was inelastic to the size of estimated cost savings.

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Introduction

Changes to Canada's system of supply management would almost certainly result in significant opposition and calls for compensation. This opposition was recently highlighted with the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, the Comprehensive Economic and Trade Agreement negotiations, and the Canada-United States-Mexico Agreement negotiations, which have resulted in $2.6 billion of compensation to the dairy industry for an 8.2% increase in market access to foreign products (les Producteurs De Lait Du Quebec 2018; Agriculture and Agri-Food Canada 2019; Bagnoli and Scholz 2021). One of the main motivating factors for opposition to liberalization is the potential financial losses stemming from a decrease in the value of quota held by producers. Quota is one of the mechanisms supply management uses to manage the supply of poultry and dairy products. It limits domestic production by limiting the amount of product that farmers can sell for further processing. Quota is allocated through provincial exchanges and has become a valuable asset held by farmers within the industry. The total value of quota held by producers has grown considerably since 1998, increasing from $14.7 billion to $37.5 billion in 2020 (Heminthavong 2018; Statistics Canada n.d.) The value of a single unit of dairy quota, measured in kg butterfat a day or approximately the milk production of one dairy cow, ranges in price from $24,000 in Ontario to $48,428 in Alberta (Statistics Canada n.d.), resulting in the average Canadian dairy farmer holding

approximately $3 million in quota[1]. If supply management were to be removed, the quota value would fall to zero, significantly increasing incentives to oppose any change.

The lack of discussion around public support for supply management and preferences for deregulation and reform is particularly noticeable given that justification for deregulation is often framed in terms of consumer protection (Geloso and Moreau 2016; Hall Findlay 2012; Hall Findlay and Dalke 2017; Bernier 2018; Dumais and Chassin 2015; Desrochers, Geloso and Moreau 2018; Geloso and Moreau 2017; Valentin 2006). Despite the negative impacts of supply management such as higher food costs that have a disproportionate effect on low-income households (Cardwell, Lawley and Xiang 2015; Desrochers et al. 2018), substantial barriers to entry into the industry seen in the cost of a unit of quota (Statistics Canada n.d.), and significant complications when negotiating trade agreements (Biden, Ker and Duff 2020; Peta 2019; Goodwin 2019). Despite these drawbacks the Canadian public appears to be strongly supportive of the system or at least not opposed to it (Angus Reid Institute 2017; IPSOS 2018; Nanos 2018). Support for supply management, particularly within the dairy industry, suggests that Canadians are willing to pay a premium on dairy and poultry products to protect those industries. However,

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[1] $Q_{avg} = \sum_p \left(\frac{\left(\frac{TMQ_p * 10^6}{365}\right) * MV_{pt}}{N_p} * \frac{TMQ_p}{\sum_p TMQ_p} \right)$ where Q_{avg} is the average value of quota held by a dairy farmer in Canada; TMQ_p is the total milk quota allocation to province P (million kg butterfat/year) (Agriculture and Agri-Food Canada 2021); MV_{pt} is the market value of quota in Province, P, at time, t ($/kg butterfat/day) (Statistics Canada n.d.); N_p is the Farms reporting shipments of milk (Agriculture and Agri-Food Canada n.d.).

deregulation strategies often seek to minimize the compensation paid to producers (Grant et al. 2014; van Kooten 2020) which in turn may decrease the likelihood of deregulation occurring as it provides greater incentives for producers to organize against deregulation (Trebilcock 2014). By examining public preferences, it may be found that Canadians are willing to pay compensation to producers, which could decrease incentives for producers to organize and increase the likelihood of deregulation occurring.

This project seeks to broaden the discussion around the dismantlement of supply management by examining public preferences for quota value compensation in the context of a quota buyback deregulation strategy. The quota buyback strategy would involve supply management being removed overnight, with farmers receiving compensation funded through a temporary tax on the retail purchase of formerly supply managed goods (Barichello, Cranfield and Meilke 2009). This method is the most advocated for strategy within the deregulation literature (Earl 2003; Valentin 2006; Hall Findlay 2012; Hall Findlay and Dalke 2017; Grant et al. 2014; van Kooten 2020; Trebilcock 2015). Overnight deregulation followed by compensation or transition assistance has been used for deregulation in the Australian dairy industry (Edwards 2003), the American peanut and tobacco industries (Dohlman, Foreman and de Pra 2009), and the Ontario tobacco industry (Schmitz et al., 2016).

The project utilizes data collected in a nationally representative survey of Canadian adults conducted between December 2018 and January 2019. Respondents were provided information about supply management and how deregulation could occur, before being asked to select the level of compensation they believed producers should receive. An experiment using a 2x2 experimental design was also incorporated into the survey to examine the effects of additional information about consumer costs and distributional implications of supply management has on

preferences for quota value compensation. The survey found a majority of Canadians, approximately 80 percent, believed producers should receive some compensation if supply management is dismantled. Support for higher levels of compensation significantly increase when respondents are provided information on the cost of supply management to their household, however support for full compensation was found to be highly inelastic in relation to the specific household cost.

Survey

The survey was conducted between December 2018 and January 2019. It was administered by the Canadian Hub for Applied and Social Research (CHASR) at the University of Saskatchewan and was hosted on VOXCO's online survey platform. Respondents for the survey were recruited by email from EKOS's Probit panel. To ensure a representative sample based on household income and province of residence quota-based sampling was utilized. Participation in the survey was voluntary, and respondents were not compensated. A total of 5,409 individuals participated in the survey of which 4,342 completed the quota value compensation question used in this study.

The survey was broken into six sections (A-F) comprised of thirty-eight questions that took respondents approximately 10-15 minutes to complete. Section A of the survey comprised seven questions about respondents' food purchasing habits and food-related policies. Section B comprised four questions that asked about general political, social, and financial issues. Sections C and E included seventeen questions that covered personal and household characteristics and respondents' beliefs about income distribution in Canada. Sections D and F made up the survey experiments, with the sections comprising a total of ten questions.

The survey experiment within Section D is based on a referendum about removing supply management. To ensure a representative sample for each treatment group, respondents were randomly assigned to one of four groups; three treatment and the control group. All four groups were provided a brief introduction to supply management, how it works, some stylized facts about the effects of supply management, and possible consequences of removing the program. Group 1 respondents were then asked to vote on the referendum question, with the responses used as the control group. Respondents in Group 2, referred to as the cost treatment group, were presented the estimated cost of supply management to their household. The respondent's expenditure on supply managed goods was estimated based on the household's income, size, and composition. A factor ranging from 10 to 50 percent in 10 percent intervals was then applied to the expenditure estimate and represented the premium paid for supply managed good. The value of the premium, total annual supply management expenditure multiplied by the premium, was presented to respondents in the group as the additional expenditure on supply management compared to a scenario in which supply management did not exist. The respondents in Group 2 then voted in the referendum question.

Respondents within Group 3, the distributional effect group, were presented with information on the distributional effect of supply management on households. As low-income households spend a greater share of their incomes on food, policies that increase the cost of food have a disproportionate effect on their households compared to higher-income households. Respondents were then asked to vote in the referendum. Respondents within Group 4, the combined treatment group, were presented with the information provided in the cost and distributional effect treatments before being asked to vote in the referendum question.

Section F is the primary area of interest for this study and examines preferences for quota value compensation. Respondents are provided a brief explanation of quota, and its potential impact on producers if supply management were removed. Respondents were then presented with a scenario in which the federal government decides to remove supply management and plans on providing compensation to producers that is funded by a temporary tax on the retail purchase of supply managed products. The tax will expire after ten years. Respondents were presented with the information in Table 1 and asked to select the level of compensation they prefer farmers to be compensated with if supply management were removed. All Respondents are informed that prices for supply managed products are expected to decrease if supply management is removed. Respondents in the cost and mixed treatment groups also had their initial cost treatment restated, giving them the ability to estimate how much they would save if supply management were to be removed. While the distributional effect treatment is not restated in Section F, it may affect Respondents' choices because the tax on food to fund compensation would increase the cost of supply managed products relative to a scenario in which no compensation is paid.

The annual costs of compensation presented in Table 1 were based on household expenditure data collected in the Survey of Household Spending (SHS) conducted by Statistics Canada and estimated using the following steps. First, for each respondent in the SHS, annual household spending on supply managed goods was calculated by adding together purchases of dairy and poultry products. Households were then grouped by household income, size, and composition, and the share of total expenditure on supply managed goods was calculated for each group. Second, it was assumed that demand for supply managed products were perfectly inelastic. This assumption allows this project to allocate the compensation bill based on the share

of total expenditure such that a household group who comprised 10 percent of total expenditures would pay 10 percent of the compensation bill. Third, the total household compensation bill was estimated by multiplying the share of group expenditure by the total compensation bill and then dividing the product by the group size. The annual household compensation bill was then calculated by dividing total expenditure by 10, the duration of the imposed tax on supply managed products. Lastly, respondents were assigned to a household group based on their responses to the household income, size, and makeup[2] questions found in Section C of the survey.

[2] Household makeup refers to the number of members of the household within each of the following age groups; 0-4, 4-14, 25-24, 25-64, 65+.

Table 1

Example of Compensation Question

Farmers of supply managed products are required to hold permits, known as "quota," in order to sell their products. Quota is a farm asset with financial value. For example, an average Canadian dairy farm owns approximately $2.8 million worth of quota assets. If supply management was removed, dairy farmers would no longer need quota to sell their milk. This would cause the value of their quota assets to fall to zero.

Suppose that the Federal Government decides to remove supply management and wants to compensate dairy and poultry farmers for their lost quota value. money to pay compensation to farmers will come from consumers like you, through a temporary tax on grocery store purchases of dairy and poultry over the next ten years.

The table below lists options for how much to compensate farmers. For each option, the table also lists the estimated taxes on dairy and poultry that households like yours will have to pay over the next ten years if supply management is removed. Note that the tax on dairy and poultry will be removed after ten years and prices for dairy and poultry will stay lower after the tax is removed.

Keep in mind that prices for these products will fall if supply management is removed. It has been estimated that similar-sized households at your income level will save approximately $555 per year through lower prices*.

Please select one of the five options below, indicating how much you think farmers should be compensated if supply management is removed:

Option	Level of Compensation to farmers	Amount of tax on dairy and poultry that you will pay every year for each of the next 10 years	The amount that an average dairy farmer will receive every year for each of the next 10 years
A	No Compensation	$0	$0
B	25% Compensation	$77.43	$70,000
C	50% Compensation	$154.87	$140,000
D	75% Compensation	$232.30	$210,000
E	Full Compensation	$309.73	$280,000
F	Prefer not to Answer		

Note. Example above is based on a household of 4 (2 adults and 2 children) with a household pre-tax income greater than or equal to $50,000 and less than $60,000. * household savings estimates were provided to households which received the cost or combined treatments treatment.

Descriptive Analysis of the Survey

A descriptive analysis of the survey results was conducted to better understand the relationship between the survey questions and the preferred level of compensation. A total of 5,409 individuals participated in the survey, of which 4,342 chose to participate in Section F, which included the questions on quota value compensation and the level of certainty of their response. Observations that included the prefer not to answer responses for the compensation question and respondents within the territories were dropped from the sample, further restricting the sample size to 3811. To simplify the analysis, 25, 50, and 75 percent compensation were grouped into a single response category, partial compensation. Further modifications to the survey questions and responses are discussed below.

Supply Management and Compensation

Sections D and F of the questionnaire contained the survey experiment, questions about supply management, and compensation. Summary statistics for these sections can be found in Table 2. Starting with preferred level of compensation, the majority of respondents, 80 percent, prefer partial or full compensation. As a follow up question, respondents were asked how certain they were in their response and were provided four options (very uncertain to very certain). As seen in Table 2, as the certainty of response increased the share of respondents selecting full compensation and no compensation increased. The less certain responses were associated with higher rates of partial compensation.

Table 2

Survey Results: Compensation and Supply Management Related Question

Variables	No Compensation	Partial Compensation	Full Compensation	Total
n =	763	2172	876	3811
% =	20%	57%	23%	100%
Response Certainty				
Not Certain	20%	64%	16%	10%
Somewhat Certain	14%	69%	16%	64%
Very Certain	33%	24%	43%	26%
Information Treatment				
Control	22%	58%	20%	24%
Cost	19%	53%	28%	25%
Distributional Effect	19%	60%	20%	25%
Combined	20%	57%	23%	26%
SM Referendum				
Vote To Remove	34%	57%	9%	37%
Vote To Keep	12%	57%	32%	63%
Reported Spending				
Low (< $40)	20%	57%	23%	83%
High (≥ $40)	21%	56%	23%	17%
Predicted Price Change				
> 20 % reduction	28%	54%	18%	27%
Between -20 and 20%	18%	59%	23%	65%
> 20 % Increase	13%	50%	38%	8%

Note. Information was collected from Section D & F of the survey. Percentages may not total 100 due to rounding.

The information treatments are likely to have an effect on the preferred level of compensation. Respondent receiving the cost treatments face a lower perceived cost possibly increasing the likelihood that they would select a higher level of compensation. Respondents in the given distributional effect treatments may be more aware of the distributional effect of increasing the price of food on low-income households. While prices are likely to decrease if supply management were removed, higher compensation levels may offset many of the potential consumer benefits deregulation, resulting in respondents selecting lower levels. As seen in Table 2, preferences for compensation appeared similar between the control, distributional effect, and

combined treatment groups. However, respondents in the cost group select partial compensation at lower rates and full compensation at higher rates than the survey average.

The survey found that a majority of Canadians, 63 percent, supported keeping supply management. Of those voting to keep supply management, 32 percent preferred full compensation while 12 percent preferred no compensation. For individuals voting to remove supply management strong preferences for no compensation and weak preferences for full compensation were observed.

Within Section D of the survey, respondents were also asked how much they spent weekly on supply management products. Respondents were presented six options, starting with less than $10 a week and increasing by $10, to more than $50 a week. A total of 65 percent of respondents reported spending less than $30 dollars per week on supply managed products and only 15 percent reported spending more than $40. Reported expenditure was grouped into two categories, low (less than $40 a week) and high ($40 a week or more), and compared with the preferred level of compensation. Preferences for compensation between expenditure groups varied by a maximum of two percent.

The last questions examined in Sections D and F relate to expected price changes due to deregulation. First, respondents were asked if they believed prices would increase, decrease, or stay the same without supply management. Respondents were then asked to indicate the

magnitude of change. When asked to indicate the direction of change, 68 percent of respondents selected prices would decrease, 20 percent selected prices would increase, and the remainder selected prices would remain the same. When asked about the magnitude of change, 65 percent selected values between -20 percent and +20 percent. Eight percent selected values over a 20 percent increase in price, while 27 percent selected values over a 20 percent decrease

in price. As seen in Table 2, there does appear to be an association between the expected price change and the preferred level of compensation. As expected, price change moved from decreasing to increasing, preferences for full compensation increased from 18 to 38 percent, while support for no compensation decreased from 28 to 12 percent.

Personal Characteristics

Personal characteristics included within the analysis were from Section E of the survey and included age, gender, and educational level. Respondents' age as of 2018 was reported within the survey. For the analysis, age was grouped into four categories 18-34, 35-54, 55-74, and 75+, respondents who did not provide were also grouped together. As seen in Table 3, the youngest age group (18-35) appeared to have the strongest preference for full compensation, while the oldest age group (75) had the weakest preferences, 27 percent compared with 21 percent. Preferences for no compensation were strongest in the 35-54 age group and weakest with the youngest age group, 23 and 16 percent, respectively.

Respondents were asked what gender they identify with and were given four options; female, male, other, and prefer not to say. To simplify the analysis, an indicator variable was generated and equaled one if the respondent was female, and zero if another option was selected. As seen in Table 3, respondents identifying as female were observed to select full compensation at higher rates and no compensation at lower rates than those who did not.

Table 3

Survey Results: Compensation and Personal Characteristics

Variables	No Compensation	Partial Compensation	Full Compensation	Total
n =	763	2172	876	3811
% =	0.2002	0.5699	0.2299	100%
Age Groups				
18-34	16%	57%	27%	5%
35-54	23%	55%	22%	30%
55-74	19%	58%	23%	51%
75+	18%	61%	21%	10%
Prefer Not to Answer	27%	47%	26%	4%
Gender				
Female	15%	58%	26%	46%
Other	24%	56%	20%	54%
Completed Education				
High School or Less	27%	53%	21%	12%
Diploma or Certificate Program	23%	56%	21%	33%
University Degree of More	16%	59%	25%	53%
Prefer Not to Answer	24%	56%	20%	1%
Completed a University Degree				
No	24%	55%	21%	47%
Yes	16%	59%	25%	53%

Note. Data collected from Section E of the Survey. Percentages may not total 100 due to rounding.

For educational attainment, respondents were asked to select the highest level of education completed at the time of the survey. Respondents were provided eight options, seven educational levels, and prefer not to say. For this analysis, levels were grouped into three categories: high school diploma or below, post-secondary certificate or diploma below a university degree, and university degree and above. As seen in Table 3, the share of respondents selecting no compensation decreased as education level increased. In the case of full compensation, respondents with a university degree or above selected full compensation at higher rates than the other groups.

Household Characteristics

From sections C and E of the survey, household size, makeup, income, and location were considered for this research. The mean household size in the survey was estimated to be 2.28, with the household size ranging from one to ten. As seen in Table 4, there does not appear to be correlation between preferences for compensation and household size. Data on the composition of the household was also collected within the survey. Respondents were asked how many members of the household were between specific age ranges and to indicate if any dependent children were living within the household. While more detailed information is available, this analysis focuses on the question asking if there is a dependent child in the household. As seen in Table 4, households with dependent children account for 15 percent of the total observations. Those households select no compensation at higher rates and partial compensation at lower rates than households without children.

Table 4

Survey Results: Compensation and Household Characteristics

Variables	No Compensation	Partial Compensation	Full Compensation	Total
n =	763	2172	876	3811
% =	20%	57%	23%	100%
Household Size				
1	19%	58%	23%	28%
2	20%	57%	23%	43%
3	21%	56%	23%	12%
4	19%	61%	20%	12%
5+	26%	47%	27%	6%
Household with Children				
Yes	24%	53%	22%	15%
No	19%	58%	23%	85%
Household Income ($)				
0 – 9,999	26%	52%	23%	1%
10,000 – 19,999	22%	53%	25%	5%
20,000 – 29,999	22%	54%	24%	8%
30,000 – 39,999	21%	59%	21%	8%
40,000 – 49,999	18%	58%	24%	8%

Variables	No Compensation	Partial Compensation	Full Compensation	Total
50,000 – 59,999	18%	58%	24%	7%
60,000 – 79,999	18%	60%	22%	11%
80,000 – 99,999	18%	58%	24%	13%
100,000 – 119,999	17%	58%	25%	10%
120,000 – 149,999	21%	60%	19%	9%
50,000 – 199,999	21%	55%	24%	8%
200,000+	25%	50%	25%	6%
Prefer not to say	25%	55%	20%	5%
Low Income Household				
No	20%	58%	23%	84%
Yes	22%	54%	24%	16%
Region/Province				
Atlantic Canada	24%	56%	20%	8%
Quebec	14%	61%	25%	19%
Ontario	18%	58%	24%	41%
Prairie Canada	28%	53%	20%	17%
British Columbia	24%	54%	22%	15%
Rural Household				
No	20%	58%	22%	84%
Yes	19%	53%	27%	16%

Note. Data collected from Section C and E of the survey. Percentages may not total 100 due to rounding.

Respondents were asked to report their annual pre-tax income by selecting the appropriate income range. The ranges increased in $10,000 increments from $0 to $60,000, then increased to $20,000 from $60,000 to $120,000. Above $120,000 intervals increased by $30,000 then $50,000, with the last interval being more than $200,000. While this analysis could treat income as a continuous variable, the marginal effect of income on preferred compensation would likely differ at various income levels given Engel's law (Anker 2011). As a result, this analysis opts to treat the income groups as a categorical variable. As seen in Table 4, preferences for compensation varied considerably for each household group but did not follow a noticeable pattern. Given the regressive distributional effect of supply management, low-income households would potentially benefit the most from deregulation and would be most affected by

high compensation costs. Using a combination of household income, size, and location data, this analysis identified households that could be categorized as low income.

This analysis used Statistics Canada's before-tax low-income cut-off (LICO) values for 2018. The LICOs are specific to community population and household sizes. Low-income values ranged from $17,844 for a 1-person household in rural Canada, to $68,598 for a household of 7 or more in a city with a population greater than 500,000 (Statistics Canada 2021). Household location was identified using the reported first three digits of the respondents' postal code, referred to as the forward sortation area (FSA). Community size was estimated using a combination of Canada Post and Statistic Canada data (Statistics Canada 2018; Canada Post Corporation 2021). FSAs were matched to population based on the 2016 census and then grouped together by city or town. Rural regions were identified by a zero as the second digit of the FSA. Respondents reported FSAs were then matched to the community population through the corresponding FSAs. Respondents were then grouped by community household size and their incomes compared to the corresponding LICO value. Households were classified as low income if the LICO was above or within their reported income range. As seen in Table 4, 16 percent of respondents were identified as low income. Support for no compensation was found to be two percentage points higher in the low-income group than in the other group. Differences in full compensation were not observed.

Given the potential relationships between supply management and rural communities, an indicator variable was generated equal to one if the respondent reported living in a rural FSA. As seen in Table 4, 16 percent of respondents were identified to be living in rural areas. Respondents in rural regions were found to have stronger preferences for full compensation than respondents not in rural areas. The respondents' province of residence was collected from the screener

question at the beginning of the survey. Given sample size concerns, respondents in New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador were grouped together into an Atlantic Canada category. Given similar concerns a Prairie Canada category was created and comprised of Alberta, Saskatchewan, and Manitoba. As seen in Table 4, support for full compensation was highest in Quebec and Ontario, 25 and 24 percent, and lowest in Atlantic and Prairie Canada, both at 20 percent. Support for no compensation was highest in Prairie Canada, 28 percent, followed by British Columbia, Atlantic Canada, both 24 percent, Ontario, 18 percent, and lastly Quebec 14 percent.

Attitudinal Characteristics

Tables 5, 6, and 7 cover questions from sections A through C of the survey. The questions covered voting preferences, perception about farm household income, food purchasing preferences, support for food policies, and the importance of policy priorities. Starting with voting intentions, support for compensation varied with the party the respondent would vote for if an election were to occur at that time. Support for no compensation ranged from 48 percent with People's Party of Canada supporters to 8 percent with supporters of the Bloc Québécois. Support for full compensation ranged from a low of 14 percent with Conservative Party of Canada supporters to 36 percent for Bloc Québécois voters.

Beliefs about farm household income did appear to be associated with preferences for compensation. Respondents who believed farm household income was below the national average selected full compensation at higher rates and no compensation at lower rates than those who believed income was at the national average. The opposite was observed for respondents who believed farm household income was above the national average, the group selected no compensation at higher rates and full compensation at lower rates than the other two groups.

Table 5

Survey Results: Compensation and Attitudinal Characteristics

Variables	No Compensation	Partial Compensation	Full Compensation	Total
n =	763	2172	876	3811
% =	20%	57%	23%	100%
Voting Intention				
Bloc Québécois	8%	56%	36%	3%
Conservative Party of Canada	32%	55%	14%	27%
Green Party of Canada	17%	51%	32%	10%
Liberal Party of Canada	13%	62%	25%	36%
New Democratic Party of Canada	12%	56%	32%	13%
People's Party of Canada	48%	37%	16%	3%
Other	30%	48%	23%	2%
Prefer not to say	20%	61%	19%	7%
Voted Centre-Right				
No	14%	59%	27%	69%
Yes	33%	53%	14%	31%
Farm Household Income				
Below Average	12%	59%	29%	38%
Average/Don't Know	20%	58%	22%	38%
Above Average	32%	52%	16%	25%

Note. Data collected from Section B and C of the Survey. Percentages may not total 100 due to rounding.

Along with political party preferences, respondents were asked to identify the five most important big picture government issues to them out of eleven possible options. These issues included aboriginal issues, crime, education, environment, government debt, health care, inequality, infrastructure, international relations, national defense, and poverty. An indicator variable was generated for each option indicating if it was in the respondent's top five issues. Out of the options, government debt, inequality, international relations, and poverty were retained as they are likely to be associated with preferences for supply management. A summary of the cross-tabular results can be found in Table 6.

Table 6

Survey Results: Compensation and Attitudinal Characteristics (*Important Issues)*

Variables	No Compensation	Partial Compensation	Full Compensation	Total
n =	763	2172	876	3811
% =	20%	57%	23%	100%
Aboriginal Issues				
Not Selected	24%	57%	20%	74%
Selected	10%	58%	32%	26%
Crime				
Not Selected	15%	59%	27%	71%
Selected	33%	53%	14%	29%
Education				
Not Selected	23%	59%	18%	35%
Selected	18%	56%	26%	65%
Environment				
Not Selected	31%	54%	15%	31%
Selected	15%	59%	26%	69%
Government Debt				
Not Selected	14%	57%	28%	57%
Selected	28%	56%	16%	43%
Health Care				
Not Selected	16%	58%	25%	12%
Selected	21%	57%	23%	88%
Inequality				
Not Selected	24%	55%	21%	63%
Selected	13%	60%	27%	37%
Infrastructure				
Not Selected	17%	58%	25%	56%
Selected	24%	56%	20%	44%
International Relations				
Not Selected	19%	57%	24%	75%
Selected	22%	58%	20%	25%
National Defense				
Not Selected	17%	58%	25%	80%
Selected	32%	52%	17%	20%
Poverty				
Not Selected	25%	54%	20%	46%
Selected	15%	59%	25%	54%

Note. Selected outcome indicates a top 5 choice for the respondents when ranking important issues. Data was collected from question SBQ1 in Section B of the survey. Percentages may not total 100 due to rounding.

The remainder of the attitudinal variables can be found in Table 7 and cover food purchasing habits and the respondent's level of agreement with a range of policy issues. Within the survey, respondents were asked to indicate their level of agreement or importance on a one to five scale for each statement. To simplify the analysis, an indicator variable was generated and assigned the response a value of 1 if the respondent selected either important or very important or agree or strongly agree for the statement and zero if not. The respondent responses appeared to follow similar response patterns, with large majorities selecting agree or strongly agree or important or very important. This pattern suggests that there may be a high degree of correlation between attitudinal variables and that a subset of these variables may effectively summarize respondents' views on these issues.

Table 7

Survey Results: Compensation and Attitudinal Characteristics (Level of Agreement)

Variables	No Compensation	Partial Compensation	Full Compensation	Total
n =	763	2172	876	3811
% =	20%	57%	23%	100%
Animal Welfare				
Not Important	25%	56%	19%	41%
Important	16%	58%	26%	59%
Safer Food				
Not Important	25%	56%	18%	18%
Important	19%	57%	24%	82%
Local Food				
Not Important	27%	55%	17%	36%
Important	16%	58%	26%	64%
Origin Label				
Disagree	29%	55%	16%	7%
Agree	19%	57%	23%	93%
GMO Labeling				
Disagree	25%	56%	19%	26%
Agree	18%	57%	24%	74%
Soft Drink Tax				
Disagree	28%	53%	19%	40%

Variables	No Compensation	Partial Compensation	Full Compensation	Total
Agree	14%	60%	26%	60%
Liberalized Trade				
Disagree	17%	54%	29%	37%
Agree	22%	59%	19%	63%
Low-Income Support				
Disagree	33%	51%	17%	33%
Agree	14%	60%	26%	67%
High-Income Tax				
Disagree	28%	54%	18%	38%
Agree	15%	59%	26%	62%

Note. Data collected from Section A and B of the Survey. Percentages may not total 100 due to rounding.

To this end, a polychoric correlation matrix was estimated to measure the degree of correlation between variables. Polychoric correlation was selected as it measures the association between the ordinal variables (Ekström 2011). The matrix identified several of the variables have a high degree of correlation, in some cases as high as 0.68. A Kaiser-Meyer-Olkin (KMO) test of sampling adequacy was conducted to determine if factor analysis was an appropriate approach. The overall sampling adequacy was estimated to be 0.70, suggesting that the factor analysis could be used to summarize the data (Kaiser and Rice 1974).

Factor Analysis

Using the estimated polychoric correlation matrix, a factor analysis was conducted to reduce the individual variables into their underlying factors. This section provides the theoretical description of the methodology, and the factor analysis results. As discussed, the survey collected information on several opinion variables relating to agriculture, food policy, and more-general political preferences. Many of these variables exhibited a high degree of correlation, suggesting there may be latent characteristics motivating respondents' choices. Factor analysis can be used to identify these latent characteristics, referred to as common factors, by condensing the data into a few factors that can effectively summarize the data (Katchova 2014). If it is assumed that each

opinion variable X_t is represented by $m = 1$ to M common factors F_m, then the common factor model can be derived (Gorsuch, 2015a), see Equation 1.

$$X_t = a_{t1}F_1 + a_{t2}F_2 + \cdots + a_{tm}F_m + e_t \quad (1)$$

This model can be described as a linear combination of factors and factor weights, also referred to as factor loadings a, and an error term referred to as the unique factor e_t(Gorsuch 2015a). The factor loadings capture the correlation between X_t and its factors F_m. The sum of squares of the factor loading for variable X_t is referred to as the variable's commonality, the proportion of the variance of X_t captured by the factors F_1 through F_m. To estimate the factor loadings, a matrix of the correlation coefficients of T attitudinal variables needs to be first estimated, which can be denoted R. Given the structure of the common factor model Equation 2 can be derived.

$$R_{tt} = F_{tm}C_{mm}F'_{mt} + U^2_{tt} \quad (2)$$

Where $R_{tt}$is the correlation coefficient matrix of the t attitudinal variables, F_{tm} is the factor loading matrix for t variables and m factors, C_{mm} is the correlation coefficient matrix of m factors, and U^2_{tt} is a diagonal matrix of the variance of each variables unique factor (Gorsuch 2015b). The factor loadings matrix can then be isolated by subtracting U^2_{tt} from R_{tt} which would result in a matrix of the correlation coefficients with a diagonal of the commonality estimates. Factor extraction can be conducted using a principal axis method (Katchova 2014).

Once factors are extracted, selecting the number of factors to retain is the next step. This step poses an important trade-off between explaining common variance and the simplicity of the model. Several rules have been developed to help determine the number of factors to retain and on the factor's eigenvalue (Gie Yong and Pearce 2013). The eigenvalue within factor analysis

can be described as the total amount of variation in the data that can be explained by a specific factor and is equal to the sum of squares of the factor loading across all variables (Goldberg and Velicer 2006). This analysis used the Kaiser criterion for factor retention, which suggests keeping factors with an eigenvalue greater than 1, as the retained factor should account for more of the variation in the data than the original variables (Gie Yong and Pearce 2013). Factor rotation is often used to simplify the structure of the analysis. This is accomplished by increasing the loadings of variables on as few factors as possible (Gie Yong and Pearce 2013). This paper utilizes a commonly used oblique rotation method called a Promax rotation and was selected to allow for correlation between factors.

If distinct factors are identified, a factor score can be estimated for each factor retained. The factor scores can be viewed as a summary of the variables making up the factor and a measure of the underlying latent characteristic motivating the respondents decisions. The factor score is specific to each individual in the survey and measures the individual's score on the factor based on their survey responses (Katchova 2014). Two steps are required to estimate the factor score. First, a factor score matrix, B, is estimated by multiplying the transposed variable correlation matrix R^{-1} with F factor loading matrix. The factor scores are then estimated by multiplying a matrix of the original survey response data X by B (Katchova 2014).

Utilizing Stata's factor analysis function, an unrotated factor loading matrix was estimated using the polychoric correlation matrix. Of the seven factors estimated, two were retained as their estimated eigenvalue was greater than one. Factor rotation was conducted using a Promax rotation resulting in two distinct factors (see Table 8, Figure 1, Figure 2).

Table 8

Factor Loadings and Scoring Coefficients

Variables	Unrotated Factors Loadings		Rotated Factors Loadings		Scoring Coefficients	
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
Animal Welfare	0.6174	0.3699		0.6823	0.03725	0.25654
Safer Food	0.5057	0.4856		0.7298	-0.01726	0.24703
Local Food	0.5491	0.397		0.6705	0.02008	0.21098
Origin Label	0.4864	0.4001		0.6393	0.00663	0.21034
GMO Label	0.5265	0.3652		0.6285	0.02546	0.20565
Soft Drink Tax	0.4157				0.04212	0.06582
Liberalized Trade					-0.03359	-0.00292
Low Inc Support	0.6758	-0.3594	0.7529		0.2771	0.03145
High Inc Tax	0.6162		0.6609		0.18074	0.03407
Government Debt	-0.6474	0.3706	-0.744		-0.28043	-0.02623
Inequality	0.496	-0.4094	0.6781		0.19527	-0.02992
Int Relations			-0.3331		-0.10055	0.01247
Poverty	0.5493		0.6114		0.17685	0.01583

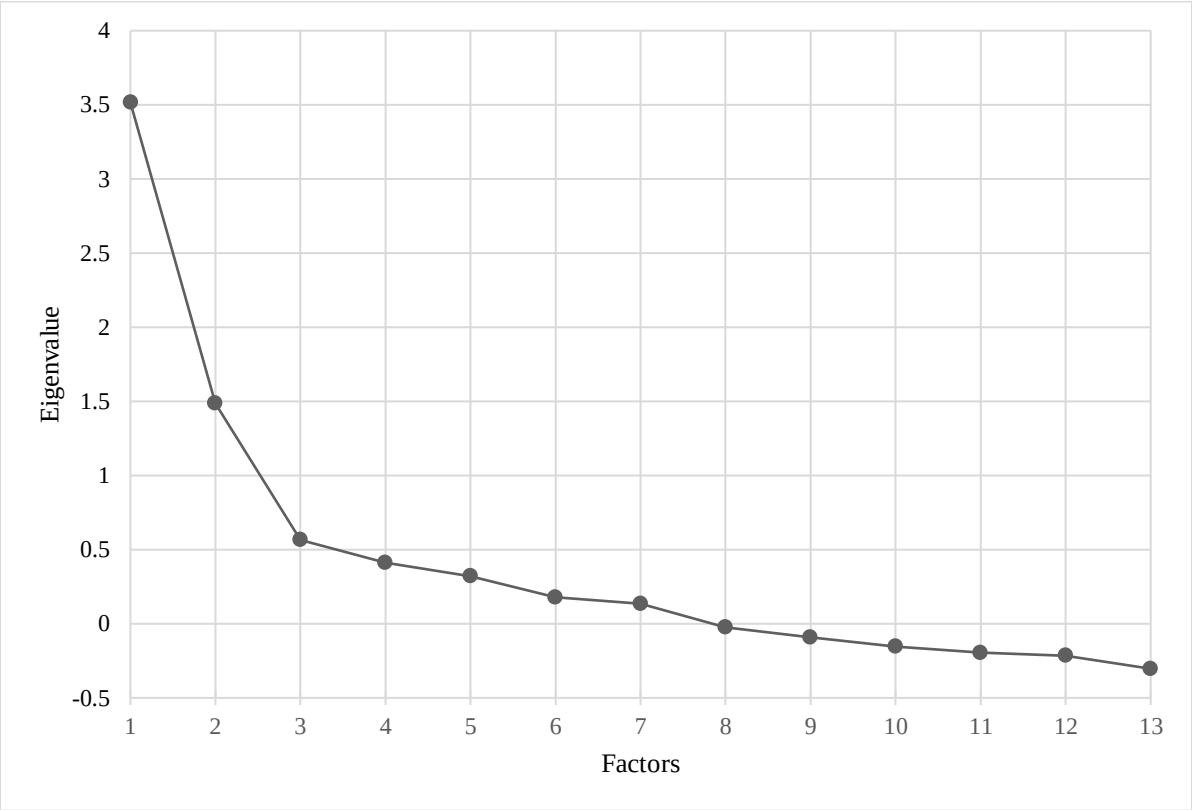
Note. Blanks indicate abs(loading) < 0.3

Factor 1 was found to be positively correlated with support for redistributive policies and identifying inequality and poverty as important issues and negatively correlated with government debt and international relations. Given the variables that loaded on the factor, the score could be interpreted as a measure of general support for progressive policies. All variables associated with food labeling are loaded on Factor 2 and are positively correlated with it. These variables indicated that respondents found product labeling important in their purchasing decisions or agreed with government policies that increased food labeling. It may be reasonable to interpret respondents that score high on this factor as placing additional value on knowing where and how their food was produced. Two variables did not load on either Factor 1 or Factor 2, and these were the variables measuring agreement with taxing soft drinks and reducing barriers to trade between Canada and other countries. Summary statistics of factors scores can be found in Table

9, and provide summary statistics for both the full sample, and when differentiated by preferred level of compensation.

Figure 1

Factor Analysis Scree Plot



Note. Factors with Eigenvalues greater than 1 are retained for the factor analysis following the Kaiser criterion.

Figure 2

Factor Loading Plot

Note. Variables are found to be significant when abs(loading) > 0.3. Factor loadings following promax rotation.

Table 9

Summery Statistics of Factor Scores

Variables	Obs.	Mean	Std. dev.	Min	Max
All Observations					
Score for Factor 1	3,811	0.3677695	0.39336	-0.431825	0.9614897
Score for Factor 2	3,811	0.9079158	0.319417	-0.029146	1.290184
No Compensation					
Score for Factor 1	763	0.1702413	0.396574	-0.431825	0.9614897
Score for Factor 2	763	0.7977735	0.3467	-0.029146	1.287265
Partial Compensation					
Score for Factor 1	2,172	0.391801	0.38243	-0.431825	0.9614897
Score for Factor 2	2,172	0.9175138	0.310406	-0.029146	1.290184
Full Compensation					
Score for Factor 1	876	0.4802328	0.354676	-0.4252	0.9614897
Score for Factor 2	876	0.9800526	0.290688	-0.029146	1.290184

Note. Factor Scores estimated using scoring coefficients found in Table 8.

Comparison of Information Treatment Groups

In order to identify a causal relationship between the information treatments and preferred level of compensation, the distribution of the characteristics making up the treatment and control groups are assumed to be identical (Hansen et al. 2006). This assumption can be checked by comparing the respondent characteristics between the treatment and control groups. If the group averages are found to be the same, it is likely that the assumption holds.

Table 10 provides a comparison of the estimated mean values of the respondent characteristics. To test if the mean values of the characteristics differed between groups a joint orthogonality test was conducted, with the null hypothesis that the treatment group does not predict the respondent characteristics (Long 2016). From Table 10, it can be observed that the

support for supply management variable (Vote to Keep SM in Referendum) was significant, this finding was expected as it was the outcome variable of the survey experiment conducted in Section D where the information treatments were first applied. Four other variables were observed to be significant: Respondents with weekly expenditures greater than or equal to $40, respondents in the 75 or older age group, respondents identifying as female, and respondents supporting the People's Party of Canada. While some variables were found to be significant, 39 of the 44 variables included within Figure 10, were not found to be significant. Suggesting the average characteristics of the respondents in each group are very similar, and the assumption likely holds.

Table 10

Descriptive Statistics by Information Treatment Groups

Variables	Control	Cost	Distributional Effect	Combined	p value
n=	905	959	962	985	
Voted to Keep SM in Referendum	0.675	0.635	0.615	0.592	0.002*
Weekly SM Expenditure ≥ $40	0.14	0.185	0.161	0.183	0.033*
Predicted Price Change					
> 20 Percent Reduction	0.267	0.271	0.269	0.289	0.681
Between -20 and 20 Percent Change	0.648	0.645	0.643	0.65	0.993
> 20 Percent Increase	0.085	0.083	0.087	0.061	0.109
Age Groups					
18-34	0.039	0.054	0.05	0.041	0.311
35-54	0.288	0.297	0.317	0.301	0.588
55-74	0.524	0.503	0.518	0.497	0.628
75+	0.11	0.102	0.075	0.123	0.005**
Prefer Not to Answer	0.039	0.044	0.041	0.039	0.932
Female	0.476	0.435	0.49	0.443	0.046*
Completed Education					
High School or Less	0.119	0.116	0.132	0.131	0.622
Diploma or Certificate Program	0.324	0.341	0.341	0.33	0.821
University Degree of More	0.552	0.535	0.521	0.532	0.588
Prefer Not to Answer	0.004	0.008	0.006	0.007	0.762
Household Size	2.262	2.323	2.279	2.263	0.683
Dependent Child in Household	1.85	1.83	1.837	1.866	0.132
Household Income ($)					

Variables	Control	Cost	Distributional Effect	Combined	p value
0 - 39,999	0.221	0.21	0.232	0.212	0.636
40,000 - 79,999	0.261	0.289	0.248	0.266	0.24
80,000 - 149,999	0.331	0.302	0.328	0.319	0.525
150,000+	0.134	0.141	0.142	0.147	0.867
Prefer Not to Answer	0.053	0.058	0.049	0.056	0.816
Low Income Household	0.149	0.152	0.17	0.148	0.495
Rural Household	0.143	0.147	0.168	0.164	0.322
Province/Region					
Atlantic Canada	0.064	0.082	0.08	0.08	0.426
Quebec	0.193	0.172	0.207	0.198	0.257
Ontario	0.433	0.415	0.38	0.413	0.132
Prairie Canada	0.176	0.187	0.175	0.157	0.394
British Columbia	0.134	0.144	0.158	0.151	0.49
Farm Household Income					
Below Average	0.388	0.371	0.389	0.355	0.377
Average/Don't Know	0.369	0.382	0.354	0.4	0.201
Above Average	0.243	0.247	0.257	0.245	0.902
Voting Intention					
Bloc Québécois	0.029	0.030	0.030	0.029	0.997
Conservative Party of Canada	0.257	0.265	0.280	0.295	0.255
Green Party of Canada	0.098	0.096	0.100	0.096	0.991
Liberal Party of Canada	0.351	0.366	0.366	0.338	0.515
New Democratic Party of Canada	0.13	0.128	0.117	0.129	0.822
People's Party of Canada	0.046	0.026	0.023	0.034	0.02*
Other	0.024	0.021	0.018	0.012	0.246
Prefer Not to Say	0.063	0.068	0.067	0.066	0.980
Agree With: Soft Drink Tax	0.606	0.615	0.591	0.57	0.192
Agree With: Liberalized Trade	0.635	0.632	0.624	0.616	0.826
Scores for Factor 1	0.375	0.351	0.373	0.373	0.485
Scores for Factor 2	0.907	0.913	0.904	0.907	0.946

Note. * p<0.05, ** p<0.01, *** p<0.001.

Theory and Methodology

This project uses a random utility model as the theoretical framework for modeling the respondent's decision-making process. Respondent *i* selects one of $j = 5$ levels of compensation C_{ij}, based on the strength of the respondent's underlying preferences for quota value compensation U_i^* (Greene and Hensher 2010b). The underlying preferences are not directly

observable and require the respondent to use a censoring mechanism to translate their preferences into observable outcomes. Changes in U_i^* are only identified when U_i^* crosses specific threshold values, μ_{ij}, which identify the boundaries of C_{ij}. The censoring mechanism for $j = 5$ levels of compensation can be seen in Equation 3.

$$\begin{array}{rcll} C_{i1} & = & No\ Compensation & if \quad \mu_{i0} < U_i^* \leq \mu_{i1} \\ C_{i2} & = & 25\%\ Compensation & if \quad \mu_{i1} < U_i^* \leq \mu_{i2} \\ C_{i3} & = & 50\% Compensation & if \quad \mu_{i2} < U_i^* \leq \mu_{i3} \\ C_{i4} & = & 75\% Compensation & if \quad \mu_{i3} < U_i^* \leq \mu_{i4} \\ C_{i5} & = & Full\ Compensation & if \quad \mu_{i4} < U_i^* < \mu_{i5} \end{array} \tag{3}$$

Utility has no natural limits, allowing us to assume that U_i^* can fall within the range $-\infty, \infty$. With this assumption, $J - 1$ threshold values need to be estimated to construct an appropriate censoring mechanism as the extreme threshold values would equal $\mu_{i0} = -\infty$ and $\mu_{i5} = +\infty$. We must also assume that $\mu_{ij} > \mu_{ij-1}$. Threshold values are unique to each individual; however, in practice, the threshold values are estimated for the population as a whole (Greene and Hensher 2010a).

$$U_i^* = \boldsymbol{x_i \beta} + \varepsilon_i \tag{4}$$

The random utility function, Equation 4, can be broken down into two parts. First, a deterministic component, $\boldsymbol{x_i \beta}$, comprised of T measurable characteristics, which would include the cost of compensation, household and personal characteristics, as well as T unknown parameters $\boldsymbol{\beta}$ (Manski 1977). Second, a stochastic component, ε_i, comprising respondents' unobservable idiosyncrasies. These idiosyncrasies provide the random component to the random utility model (RUM), and it is assumed that preferences for compensation are randomly distributed throughout the population (Greene and Hensher 2010a). Assumptions about the distribution of the preferences allow us to estimate the likelihood of respondent *i,* selecting

compensation level C_{ij}, given the respondent's characteristics and helps to explain why respondents with identical characteristics prefer different levels of compensation.

While there are several methods for estimating RUMs, this project uses an ordered logit model (OLM), also referred to as cumulative odds or proportional odds model. The OLM was introduced by McCullagh (1980) and is the most commonly used form of ordinal logistic regression (Hosmer, Lemeshow and Sturdivant 2013). Differences between OLM and other ordered choice models come from the assumptions made about the distribution of the error term, methods of comparing probabilities, and the application of the parallel regression assumption (Greene and Hensher 2010a; Fullerton 2009). The OLM assumes that the error term follows a standard logistic distribution, differentiating it from the ordered probit model developed by McKelvey and Zavoina (1975). However, these models are similar as they utilize the outcome's cumulative probability and impose the parallel regression assumption on all variables. The cumulative probability, γ_{ij}, which is the probability that the respondent would select at or below a level of compensation, can be derived using a logit transformation if the error term is assumed to follow standard logistic distribution, which can be seen in Equation 5.

$$Prob[C_i \leq j|x_i] = \gamma_{ij} = \Lambda(\mu_j - \boldsymbol{x_i\beta}) = \frac{e^{\mu_j - \boldsymbol{x_i\beta}}}{1 + e^{\mu_j - \boldsymbol{x_i\beta}}} \quad (5)$$

To derive the probability of selecting a specific level of compensation, the cumulative probability of being at the lower adjacent level, $j-1$, is subtracted from the probability of being at or bellow j. The equation for the response probability which is denoted here as π_{ij} can be seen in Equation 6.

$$\pi_{ij} = Prob[C_i = j|x_i] = \Lambda(\mu_j - \boldsymbol{x_i\beta}) - \Lambda(\mu_{j-1} - \boldsymbol{x_i\beta}) = \frac{e^{\mu_j - \boldsymbol{x_i\beta}}}{1 + e^{\mu_j - \boldsymbol{x_i\beta}}} - \frac{e^{\mu_{j-1} - \boldsymbol{x_i\beta}}}{1 + e^{\mu_{j-1} - \boldsymbol{x_i\beta}}} \quad (6)$$

The log-likelihood function used for estimating the respondents preferred level of compensation is derived using the response probabilities of each level of compensation. In addition to the response probability, a binary variable indicating the respondents preferred level of compensation is included in the log-likelihood function in Equation 7.

$$LogL = \sum_{i=1}^{N}\sum_{j=1}^{J} m_{ij} \log\left[\Lambda\left(\mu_j - \boldsymbol{x_i\beta}\right) - \Lambda\left(\mu_{j-1} - \boldsymbol{x_i\beta}\right)\right] \tag{7}$$

The model uses maximum likelihood estimation to estimate all J outcomes of C simultaneously and produces one set of $\boldsymbol{\beta}$ coefficients and $J-1$ threshold value estimates. Further transformations of the $\boldsymbol{\beta}$ coefficients are required to obtain the marginal effects of the characteristics. Without the additional transformation, $\boldsymbol{\beta}$ can only indicate the direction in the change of probability as x_i changes value. The marginal effects of the individual characteristics on the response probability can be seen in Equation 8 and are interpreted as the change in the probability of selecting $C_i = j$ given a one-unit change in x_i.

$$\frac{\partial \pi_{ij}}{\partial x_i} = \left[\Lambda'^{(\mu_j - x_i\beta)} - \Lambda'^{(\mu_{j-1} - x_i\beta)}\right]\beta \tag{8}$$

As a result of multiple outcome levels, for each estimated coefficient J, marginal effects are estimated with the sum of the marginal effects equal to zero.

Results

The base model used in this project estimates the probability of the respondent selecting each of J levels of compensation as a function of variables discussed in the survey section. A simplified 3 level model ($J = 3$) is used in which 25 percent, 50 percent, and 75 percent compensation are combined into a single category, partial compensation. A full list and description of the variables used can be found in Table 11. The based model is estimated as a

function of support for supply management, treatment group, weekly expenditure on supply managed products, perceptions of price change, and their demographic and attitudinal characteristics. The attitudinal characteristics include voting intention, beliefs around farm household income, agreement with taxing soft drinks, agreement with reducing barriers to trade, and the scores for Factors 1 and 2.

Table 11

Variables Included in the $J = 3$ *Base Model*

Variable	Description	Scale of Variable
Dependent Variable		
Level of Compensation	How much you think farmers should be compensated if supply management is removed?	1. No Compensation 2. Partial Compensation 3. Full Compensation
Independent Variables		
Treatment Group	Assigned treatment group.	1. Control* 2. Cost 3. Distributional Effect 4. Combined
Support for Supply Management	Section D referendum Question	1. Voted to Remove* 2. Voted to Keep
Weekly Expenditure	The respondents estimated weekly expenditure on supply managed products.	1. Less than $40* 2. $40 or More
Predicted Price Change	Predicted change if supply management were removed	1. > 20 Percent Reduction 2. Between -20 and 20* 3. > 20 Percent Increase
Age Group	Age of respondent in 2018.	1. 18-34 2. 35-54* 3. 55-74 4. 75+ 5. Prefer Not to Say
Female	Respondent identified as female within the survey.	1. No* 2. Yes
University Education	The respondent has completed a bachelors or an advanced degree.	1. No* 2. Yes
Province/Region	Reported household location	1. Atlantic Canada 2. Quebec* 3. Ontario

Variable	Description	Scale of Variable
		4. Prairie Canada
		5. British Colombia
		1. No*
Rural Household	Household identified Rural indicated by their FSA	2. Yes
Household Size	Total member of the household	Continuous variable
		1. No*
Children	Household with atleast one dependent child	2. Yes
		1. No*
Low Income Household	Household identified as low income	2. Yes
		1. No*
Centre-Right Voter	Respondent s who indicated preferences for a right leaning party	2. Yes
		1. Below Average
Farm Income Comparison	How does farm household incomes compare with the average Canadian household income?	2. Average/ Don't Know*
		3. Above Average
		1. No*
Soft Drink Tax	Respondent agreed or strongly agreed with Canadian policies that taxed soft drinks	2. Yes
		1. No*
Reduce Trade Barriers	Respondent agreed or strongly agreed with Canadian policies that Reduce trade barriers between Canada and other countries	2. Yes
		Continuous variable
Factor 1	Score for factor 1	Continuous variable
Factor 2	Score for factor 2	

Note. * Indicates base outcome for categorical variables

Two additional variables were modified for the random utility model based in results from the descriptive analysis. First, educational level was converted into a binary variable indicating if the respondent completed a university degree. Second, the categories used for political party preferences were simplified to a binary variable indicating if a respondent selected either the Conservative Party of Canada or the Peoples Party of Canada.

Base Model

The estimated coefficients for the model can be found in Table 12 and can be interpreted as increasing (positive sign) or decreasing (negative sign) the probability of selecting a higher level of compensation. Marginal effects are estimated for each level of compensation and are also presented in the table. The marginal effects can be interpreted as the change in the

probability of selecting compensation level J given a change in variable x, adding across each level of compensation the sum of marginal effects should be zero.

Table 12

J=3 Base Model Results

Base Model	Coefficient	SE	dy/dx No Comp.	dy/dx Partial Comp.	dy/dx Full Comp.
Information Treatment					
Cost	0.453***	0.096	-6.3%	-0.7%	7.0%
Distributional Effect	0.172	0.091	-2.6%	0.2%	2.4%
Combined	0.293**	0.093	-4.3%	0.0%	4.3%
SM Referendum					
Voted to Keep SM	1.059***	0.078	-16.0%	0.8%	15.1%
Weekly Spending					
> $40	0.0768	0.092	-1.0%	-0.2%	1.2%
Predicted Price Change					
Decrease	-0.111	0.076	1.6%	0.1%	-1.7%
Increase	0.333*	0.134	-4.1%	-1.6%	5.7%
Age					
18-34	0.352*	0.173	-4.3%	-1.7%	6.0%
35-54	0.00136	0.087	0.0%	0.0%	0.0%
75+	-0.0253	0.106	0.4%	0.0%	-0.4%
Prefer Not to Say	-0.0755	0.179	1.1%	0.1%	-1.1%
Gender					
Female	0.136*	0.067	-1.9%	-0.3%	2.1%
Education					
University Degree	0.289***	0.069	-4.0%	-0.4%	4.4%
Household Size	0.0722*	0.035	-1.0%	-0.1%	1.1%
Household with Child					
Yes	-0.217	0.122	3.1%	0.1%	-3.2%
Low-Income Household					
Yes	-0.192	0.099	2.8%	0.1%	-2.9%
Rural Household					
Yes	0.191*	0.094	-2.5%	-0.6%	3.1%

Base Model	Coefficient	SE	dy/dx No Comp.	dy/dx Partial Comp.	dy/dx Full Comp.
Region/Province					
Atlantic Canada	-0.515***	0.142	7.6%	-0.2%	-7.4%
Ontario	-0.0591	0.089	0.7%	0.2%	-1.0%
Prairie Canada	-0.251*	0.114	3.4%	0.5%	-3.9%
British Columbia	-0.269*	0.113	3.7%	0.5%	-4.2%
Farm Household Income					
Below Average	0.318***	0.075	-3.9%	-1.5%	5.4%
Above Average	-0.466***	0.088	7.4%	-1.3%	-6.2%
Party Preference					
Centre Right	-0.199*	0.089	2.8%	0.2%	-3.0%
Taxing Soft Drinks					
Agree	0.244***	0.073	-3.4%	-0.3%	3.7%
Reducing Trade Barriers					
Agree	-0.112	0.071	1.5%	0.2%	-1.8%
Factor 1 score	0.471***	0.112	-6.5%	-0.8%	7.3%
Factor 2 score	0.251*	0.121	-3.4%	-0.4%	3.9%
Threshold Value 1	-0.0886	0.186			
Threshold Value 2	2.980***	0.194			

Note. * p<0.05, ** p<0.01, *** p<0.001.

As seen in Table 12, both the cost and mixed treatment groups were found to be positive and significant indicating that respondents in the groups were more likely to select higher levels of compensation than when compared to the control group. Examining the marginal effects, respondents in the cost group were seven percent more likely to select full compensation and six percent less likely to select no compensation than the control group. The effect of the combined treatment was found to be smaller than the cost alone. Being assigned to the combined treatment increased the probability of selecting full compensation by four percent and decreased the probability of selecting no compensation by four percent. The distributional effect treatment was not found to be significant at a 95 percent confidence level.

Support for supply management was found to be the strongest predictor of compensation preferences. Respondents voting to keep supply management were 15 percent more likely to select full compensation than respondents that voted to remove the system. While directly affecting amount of compensation that would be paid following deregulation, high reported spending on supply managed products (≥ $40) was not found to be significant when predicting preferred level of compensation. Individuals who believed prices would increase if supply management were to be removed were six percent more likely to select full compensation than respondents selecting prices would remain the same. This outcome may be a result of correcting a misconception as it was stated in the compensation question that prices would likely decrease is supply management were to be removed.

All three personal characteristics included within the model were found to have at least one significant outcome. Individuals within the lowest age group, 18-34, were found to support higher levels of compensation compared to the 55-74 age group. Respondents identifying as female were two percent more likely to support full compensation than those that identified with another gender. Lastly, respondents who completed university degrees were four percent more likely to support full compensation than those who did not.

The coefficient for household size was found to be positive and significant indicating that larger house sizes supported higher levels of compensation. The indicator variable for household with children was not found to be significant at a 95 percent level of confidence but suggests a negative relationship with compensation. Households identified as low income were four percent more likely to support no compensation than the base outcome. Household location was found to be a significant indicator of compensation preferences. Households identified as rural were three percent more likely to select higher levels of compensation than those that were not and

household in Atlantic Canada, Prairie Canada, and British Columbia, were eight, three and four percent more likely to support no compensation than in Quebec.

Perceptions of farm household income were found to be statistically significant. Respondents who believed farm household income was below the national average were five percent more likely to support full compensation and respondents who believed farm household income was above the national average were seven percent more likely to support no compensation when compared to the base outcome. Support for Centre-right political parties were found to be significant. Respondents who intended to vote for the People's Party of Canada or the Conservative Party of Canada were three percent more likely to select no compensation than compared to those who did not. Respondents who agreed with taxing soft drinks were found to be four percent more likely to support full compensation than those who did not, while support for increased trade liberalization was not found to be significant. Factor scores for both factors 1 and 2 were found to be positive and significant indicating that as the factor scores increased, i.e., increased agreement with progressive policies (factor 1) and increased interest in food information (factor 2), the probability of selecting higher levels of compensation increased.

Non-Factor Model Comparison

This section compares original base model to a model in which the factor scores are substituted out for the underlying variables (non-factor model). Goodness of fit statistics were first compared to evaluate model performance then estimated coefficients are compared to see if the inclusion of the factor scores resulted in significant changes in the estimated coefficients.

The non-factor model was found to have a slightly greater explanatory ability when compared to the base model given the higher R^2, 0.106 compared with 0.102, and lower Akaike's Information Criteria (AIC) values, 6770.827 compared with 6764.521, see Table 13. However,

given the increase in complexity of the non-factor model, i.e., more variables, when comparing models using the Bayesian Information Criteria (BIC), the base model was found to have a lower value. Given the conflicting results of comparing the AIC and BIC, and similarities with the R^2 value, the models can be viewed equivalent in terms of fit.

Table 13

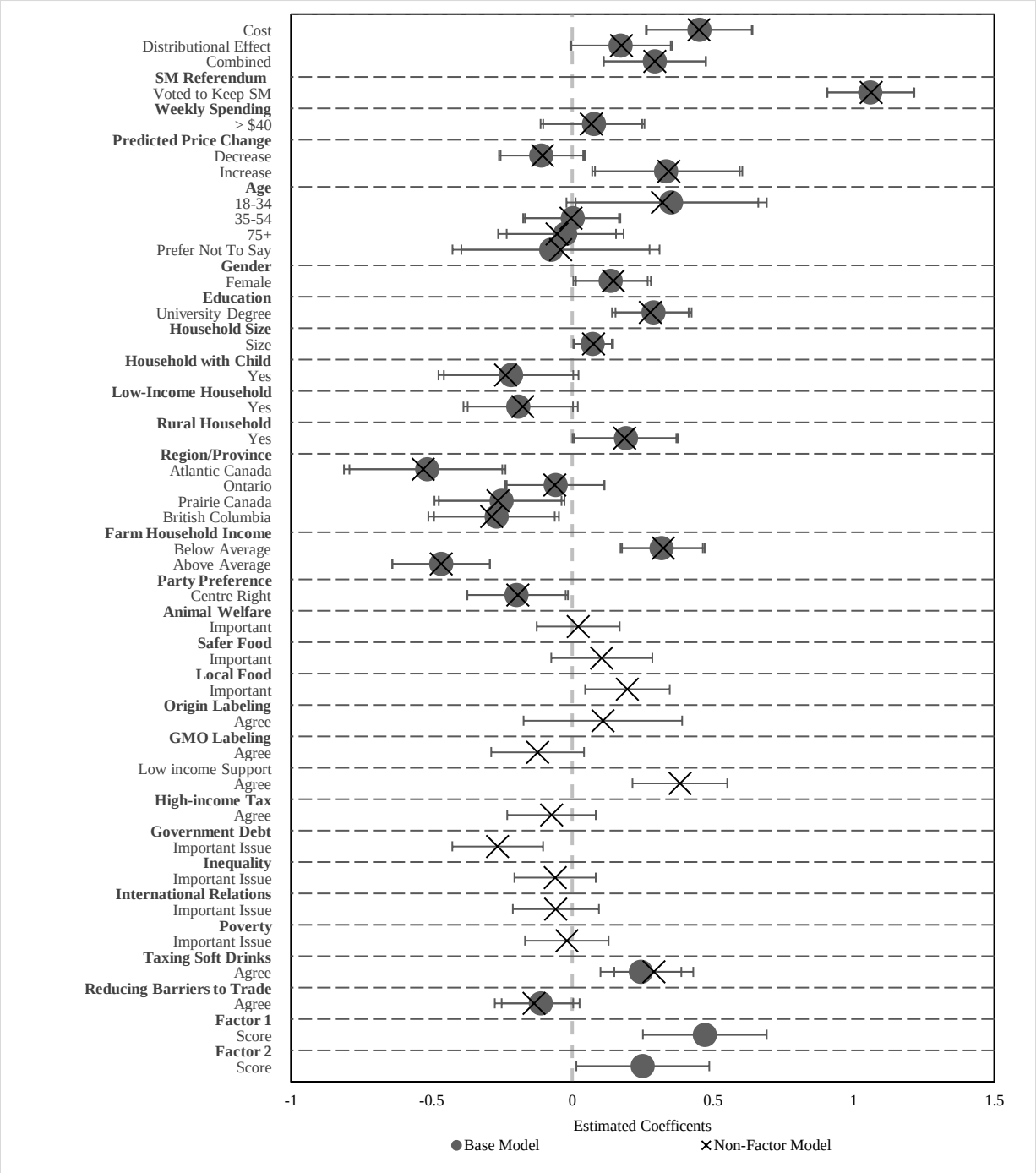
Comparison of fit statistics between models

	Base Model	Non-Factor Model	J = 5 Model	Control Model	SM Omitted	Cost Model
Outcomes	3	3	5	3	3	2
Observations	3811	3811	3811	905	3811	1944
LL						
Model	-3355.414	-3343.26	-5593.222	-784.514	-3446.93	-972.24
Intercept-only	-3736.359	-3736.359	-5999.217	-874.665	-3736.359	-1108.293
R^2						
McFadden	0.102	0.105	0.068	0.103	0.077	0.123
IC						
AIC	6770.827	6764.521	11250.443	1623.028	6951.86	2000.48
BIC	6958.196	7008.101	11450.304	1752.842	7132.983	2156.51

Figure 3 provides a comparison of the estimated coefficients. Coefficients were found to be statistically significant if the confidence interval did not intersect with zero, as indicated by the vertical dashed line. Significance between the two models were tested by calculating the proportional overlap (POL) of the percent confidence intervals for the estimated coefficients. Significant differences were found if the POL < 0.59 which gives an estimated p value of 0.05 (Cumming 2009). Significant differences in estimated coefficients were not observed, further suggesting that the factors were effective at summarizing the set of attitudinal variables without significantly affecting the model.

Figure 3

Comparison of J=3 Base and Nonfactor Models



Note. Coefficients are significant if they do not intersect zero. Results are significantly different if POL < 0.59

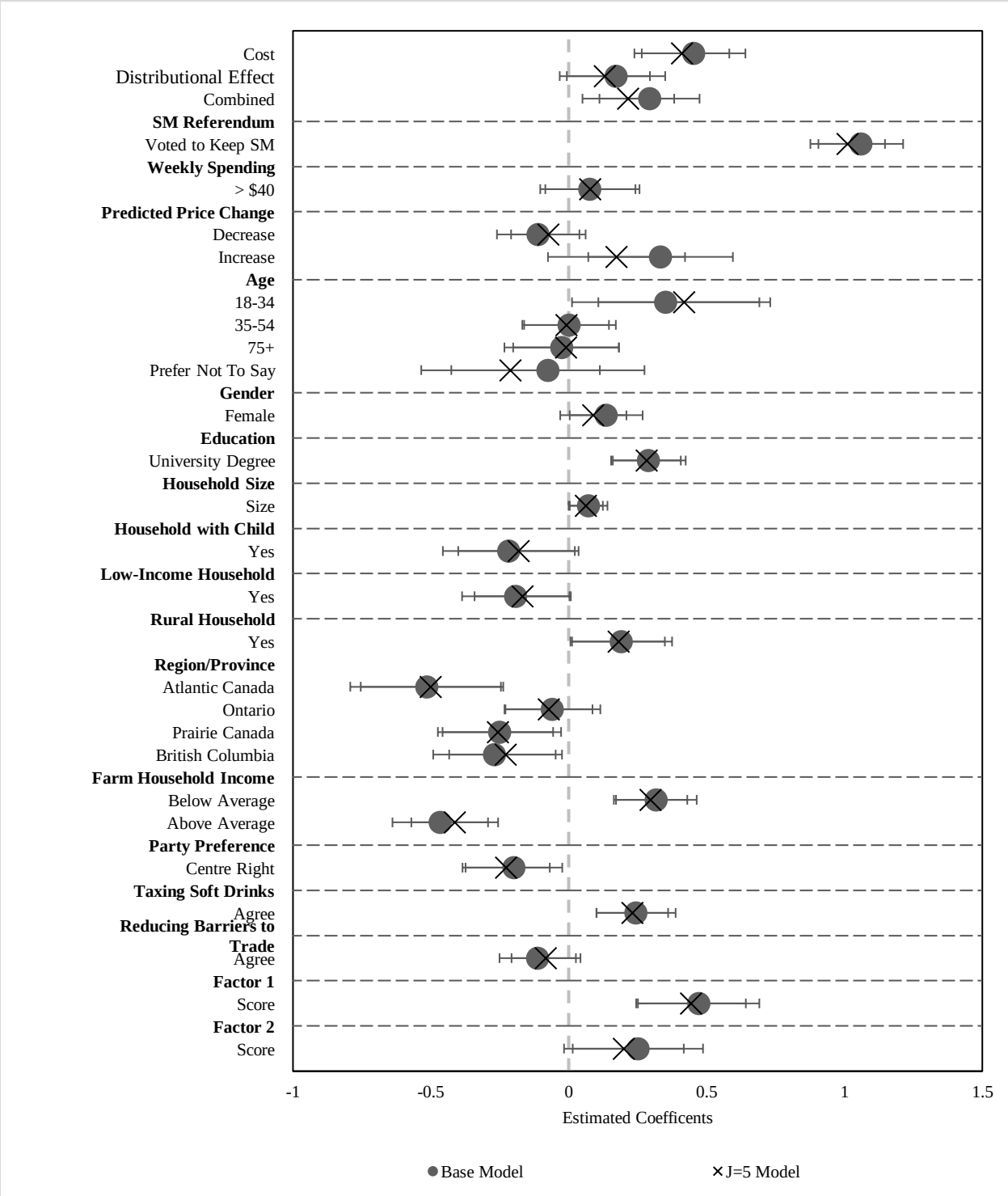
Five Outcome Comparison

This section compares the base model using $J = 5$ outcome levels to the $J = 3$ base model. The models performance, estimated coefficients and marginal effects compared to see if changing the number of outcomes significantly affect the estimated values. Theoretically moving between three and five levels of compensation should not affect the estimated coefficients and corresponding marginal effects as the change levels only effect the censoring mechanism and not the distribution of preferences.

As seen in Table 13, a large reduction R^2 value was observed when the $J = 5$ model was used. Estimated AIC and BIC values were also higher with the $J = 5$ suggesting decreased model performance when compared to the $J = 3$ model. To evaluate the model's predictive ability, the predicted probability for each level of compensation were estimated and then compared with the survey results. It was found that the mean predicted values were able to closely approximate the survey data and showed no significant differences between the mean predicted and survey values. Figure 4 provides a comparison of the estimated coefficients for the $J = 3$ and $J = 5$ models. Using the POL method to test significance, significant differences were not found.

Figure 4

Comparison of J=3 Base and J=5 Factor Models



Note. Coefficients are significant if they do not intersect zero. Results are significantly different if POL < 0.59

Bad Control

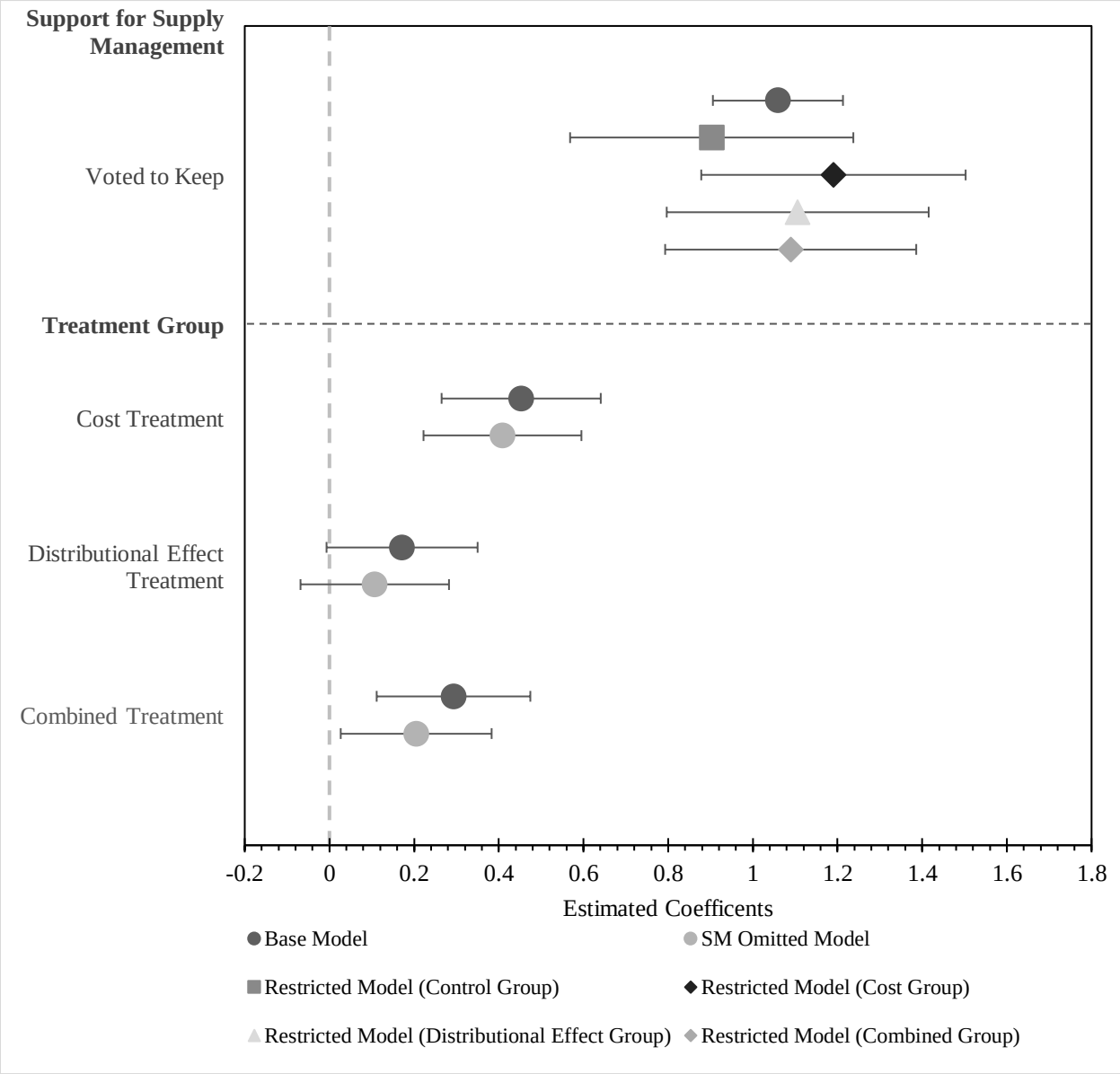
Bad controls refer to independent variables included within model that are themselves dependent on experiment conducted (Cinelli, Forney and Pearl 2022). By definition, the support for supply management variable included within the base model would be considered a bad control, as it is the outcome variable of the information experiment conducted in Section D of the survey. As a result of the experiment, support for supply management is dependent on the information treatment group. This relationship creates potential issues in the interpretation of the findings as the estimated coefficient for support may be capturing some of the effects of the information treatment on preferred level of compensation (Cinelli et al. 2022). While it is best practice to omit bad controls from the model, given the relationship between support for supply management and support for compensation omitting the variable would like result in substantial omitted variable bias.

To examine the effects of the inclusion of the supply management variable, the model was run dependent on treatment group. The estimated coefficients were then compared to the base model and the control group restricted model, see Figure 5. Within the control group restricted model, the support for supply management variable can be considered a good control as the information treatments were not present. If the estimated coefficients for support for supply management variable significantly differed it may indicate that some of the effects of the information treatments on preferred level of compensation are being attributed to support for supply management. Using the POL approach, it was found that the coefficients did not significantly differ at a 95% level of confidence, suggesting that the effects of the information treatment group on preferred level of compensation are not being misattributed to preferences for supply management.

The next model compared omitted the support for supply management variable (SM omitted model). By omitting the support variable, the full effect of the treatment variables should be observed on preferences for compensation. Significant differences between the base model and the restricted model may indicate the support variable has a mediating effect on the treatment estimates. Figure 5 provides a comparison between the two models; The coefficients for the SM omitted model were not found to be significantly from the base model. As seen in Table 13, the model performance decreased when the support for supply management variable was removed from the model, the R^2 value decreased from 0.102 to 0.077, and increases in the AIC and BIC values were observed. Given the limited effects the treatments had on the support variable coefficient, and the limited effect of including the support variable had of the treatment coefficients, it may be reasonable to continue to include the support for supply management variable within the base model, given the models increased performance.

Figure 5

Comparison of J=3 Base and Restricted Models



Note. Coefficients are significant if they do not intersect zero. Results are significantly different if POL < 0.59.

Cost Model

The analysis so far has not directly incorporated the estimated household cost of supply management presented in the cost treatment or estimated household cost of compensation within

the models examined. Costs associated with supply management were omitted from the base model as the information was only provided to respondents in the cost and mixed treatment groups. Cost associated with compensation were omitted as the values were not randomized and were estimated as a linear combination of household size, makeup, and income which already incorporated to some extent in the base model.

To explore the effect of cost on preferences for compensation a modified base model was estimated with the observations limited to those who have received either the cost or mixed treatment. By restricting the sample all respondents were provided both the annual cost of supply management and the annual cost of compensation. If it is assumed that the annual cost of supply management can be interpreted as the annual benefit from deregulation, a net cost/benefit of full compensation can be calculated for each observation and included within the model. Additionally, the effects of the distributional effect treatment can be included because approximately half of the observations received the distributional effect treatment (respondents in the mixed group), a binary variable indicating treatment group was also included with the modified model. Lastly, the model was simplified to account for the large decrease in observations (3811 to 1944) instead of estimating an ordered model with three outcome variables a binary variable outcome variable is used indicating if the respondent selected full compensation.

Table 14 provides the estimated coefficients and marginal effects for the cost model. The binary model outputs can be interpreted in the same way as the ordered models used throughout the analysis. Additionally, the marginal effects of the cost model can be compared to the base model's effects for selecting full compensation. Figure 6 shows the predicted probability of selecting full compensation at varying levels of annual cost. From the figure it can clearly be

seen that as the annual cost increases the probability of selecting full compensation decreases. However, preferences for full compensation appear to be inelastic as the probability of selecting full compensation only changes by approximately 12 percent across the full range of cost values, a change of $1000 dollars.

Table 14

Cost Model Results

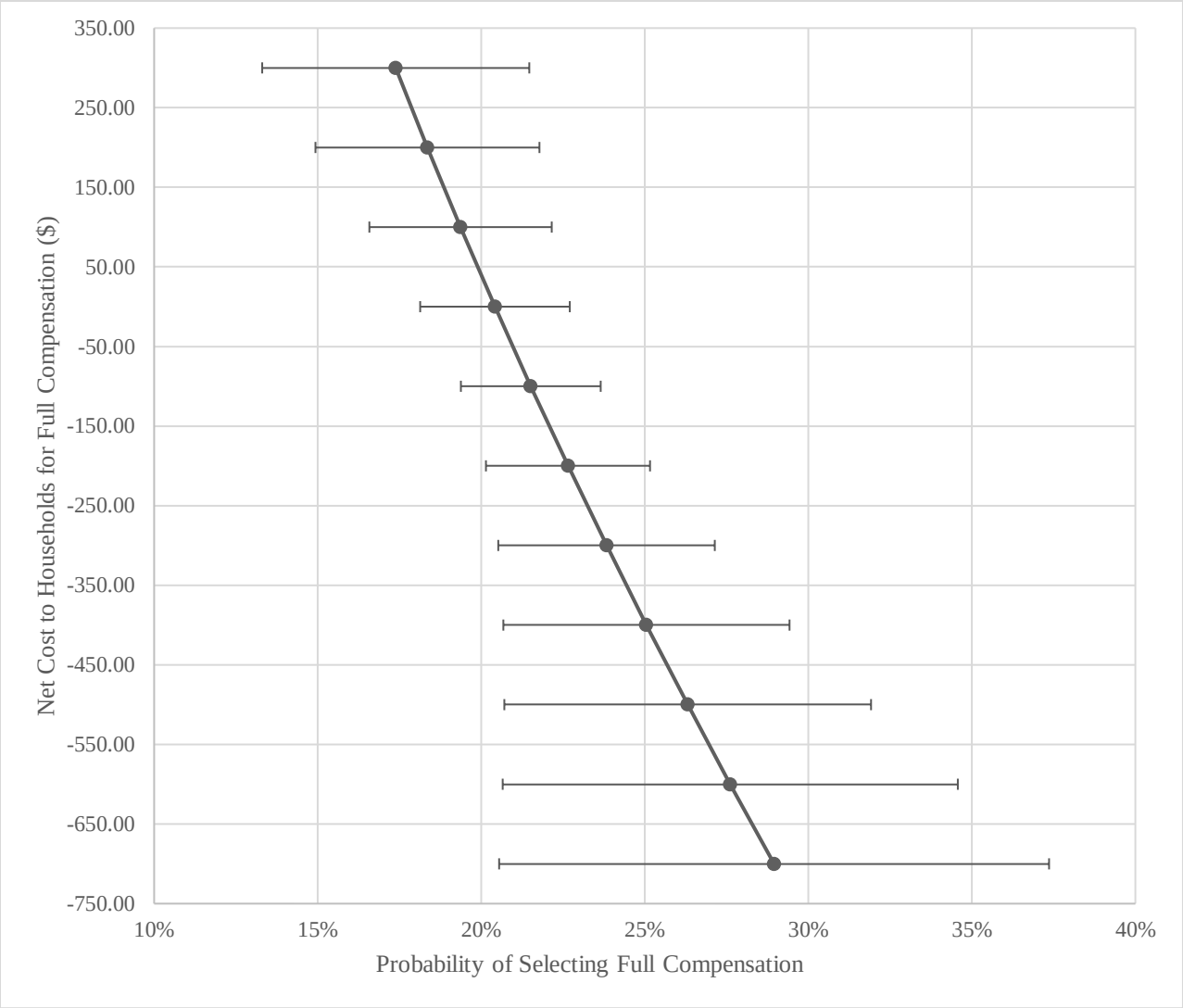
Cost Model	Coefficient	SE	dy/dx Not Selected	dy/dx Selected
Net Cost/Benefit	0.000654*	0.000327	-0.01%	0.01%
Treatment				
Distributional Effect	-0.253*	0.112515	4.3%	-4.3%
SM Referendum				
Voted to Keep SM	1.430***	0.151238	-22.0%	22.0%
Weekly Spending				
> $40	-0.0175	0.153717	0.3%	-0.3%
Predicted Price Change				
Decrease	-0.0229296	0.135763	0.4%	-0.4%
Increase	0.532**	0.191738	-10.1%	10.1%
Age				
18-34	0.293	0.295096	-5.3%	5.3%
35-54	0.136	0.146878	-2.3%	2.3%
75+	-0.227	0.190622	3.5%	-3.5%
Prefer Not to Say	0.101	0.266856	-1.7%	1.7%
Gender				
Female	0.22	0.114186	-3.7%	3.7%
Education				
University Degree	0.179	0.119462	-3.0%	3.0%
Household Size	0.077	0.058193	-1.3%	1.3%
Household with Child				

Cost Model	Coefficient	SE	dy/dx Not Selected	dy/dx Selected
Yes	-0.223	0.204719	3.6%	-3.6%
Low-Income Household				
Yes	-0.14	0.161832	2.3%	-2.3%
Rural Household				
Yes	0.141	0.154532	-2.4%	2.4%
Region/Province				
Atlantic Canada	-0.1617156	0.240579	2.5%	-2.5%
Ontario	0.146	0.157894	-2.4%	2.4%
Prairie Canada	-0.000513	0.199293	0.0%	0.0%
British Columbia	0.267	0.192217	-4.6%	4.6%
Farm Household Income				
Below Average	0.0479	0.125567	-0.9%	0.9%
Above Average	-0.546***	0.159407	8.4%	-8.4%
Party Preference				
Centre Right	-0.177	0.161978	2.9%	-2.9%
Taxing Soft Drinks				
Agree	0.096	0.128304	-1.6%	1.6%
Reducing Barriers to Trade				
Agree	-0.156	0.114848	2.7%	-2.7%
Factor 1 score	0.303	0.197459	-5.1%	5.1%
Factor 2 score	0.336	0.219827	-5.7%	5.7%
Intercept	2.79395	0.332589		

Note. * p<0.05, ** p<0.01, *** p<0.001.

Figure 6

Probability of Selecting Full Compensation at Varying Levels of Net Cost



Note. Negative values indicate a net benefit (increased savings) to households as a result of supply management dismantlement.

Drop Out

The last section of this project examines who participated in the compensation section of the survey (Section F), and who provided a level of compensation as an answer (i.e., did not select prefer not to say). The first step in the process was identifying who participated in Section

F of the survey. An indicator variable was generated and was equal to one if the respondent provided an answer to the compensation question which included any level compensation or the prefer not to answer response. The indicator variable was then substituted into the base model as the dependent variable and estimated using a logit model. The model estimated the probability of participating in section F of the survey as a function of the variables included within the base model.

As seen in Table 15, significant coefficients were observed for the following variables, support for supply management, estimated price change, age group, gender, household location, perception around farm income, and political preferences. Of Interest to this analysis, individuals who voted to keep supply management were found to be approximately Three percent less likely to participate in Section F of the survey. Respondents in the youngest two age groups were found to be more likely to participate in Section F than those in the 55-74 age group. Respondents identifying as female were less likely to participate than those who did not. Respondents from Ontario and British Columbia were found to be significantly more likely to respondent in Section F of the survey compared with individuals from Quebec. Lastly respondents who voted for a centre-right party were approximately four percent more likely to participate in Section F.

In the next step of the analysis an indicator variable was generated and equaled one if the respondent selected a level of compensation and zero they selected prefer not to answer. The indicator variable was then substituted into the base model as the dependent variable, and the coefficients and marginal effects were estimated.

Also seen in Table 15, significant coefficients were estimated for support for supply management, perceptions around price change, age, education, and perceptions around farm

household income. Respondents who voted to keep supply management were seven percent more likely to select prefer not to answer than those who did not. Respondents in the 75 and older age group were found to be five percent less likely to provide a preferred level of compensation. University graduates were found to be two percent more likely to provide a substantive answer than those who had less than a university degree. Lastly, respondents who believed farm household income was below the national average was found to be 4 percent more likely to indicate a preferred level of compensation than when compared to the base outcome. Both models were able to identify significant variables when estimating the probability of participating in the Section F or providing a substantive answer. As a result, there is likely some level of selection bias present within the base model estimates.

Table 15

Dropout Model Results

Drop Out Models	Section F Coefficients	SE	Response Coefficient	SE
Information Treatment				
Cost	-0.0473	0.098	0.145	0.140
Distributional Effect	0.0757	0.101	-0.0718	0.135
Combined	0.0337	0.099	-0.0403	0.135
SM Referendum				
Voted to Keep SM	-0.200*	0.087	-0.843***	0.134
Weekly Spending				
> $40	-0.041	0.102	-0.135	0.141
Predicted Price Change				
Decrease	0.255**	0.090	0.305*	0.126
Increase	-0.348**	0.112	-0.0156	0.162
Age				
18-34	0.739***	0.222	0.303	0.294
35-54	0.382***	0.099	-0.046	0.129
75+	-0.113	0.110	-0.482***	0.144
Prefer Not to Say	-0.367*	0.146	-0.737***	0.195

Drop Out Models	Section F Coefficients	SE	Response Coefficient	SE
Gender				
Female	-0.254***	0.072	-0.149	0.101
Education				
University Degree	0.14	0.073	0.213*	0.100
Household Size	-0.0241	0.040	0.067	0.057
Household with Child				
Yes	-0.148	0.139	-0.0459	0.178
Low-Income Household				
Yes	0.101	0.098	-0.346**	0.126
Rural Household				
Yes	-0.003	0.096	0.022	0.133
Region/Province				
Atlantic Canada	-0.018	0.139	-0.104	0.198
Ontario	0.227*	0.094	0.00257	0.133
Prairie Canada	0.0311	0.114	-0.00085	0.163
British Columbia	0.304*	0.123	-0.0546	0.165
Farm Household Income				
Below Average	0.0542	0.079	0.417***	0.112
Above Average	0.213*	0.094	0.208	0.127
Party Preference				
Centre Right	0.251*	0.101	0.172	0.139
Taxing Soft Drinks				
Agree	0.0529	0.078	0.103	0.107
Reducing Barriers to Trade				
Agree	0.115	0.073	0.184	0.098
Factor 1 score	0.064	0.120	-0.199	0.165
Factor 2 score	0.0352	0.134	0.0887	0.181
Intercept	1.119***	0.201	2.159***	0.298

Note. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Conclusion

If the dismantlement of supply management were to occur, a full impact approach to deregulation accompanied with compensation may be a politically viable strategy given public preferences for quota value compensation. A total of 80 percent of respondents selected they believed producers should receive at least partial compensation if deregulation were to occur, and that value remained constant across treatment groups. Moreover, a majority of respondents selected compensation levels at or above 50 percent which would be well above levels proposed by Grant et al. (2014) and van Kooten (2020).

Respondents who received the cost information treatment were found to be significantly more likely to support higher levels of compensation. The estimated net cost of full compensation was also found to significantly effect support for full compensation. As the net cost to household increased, the respondents were found to be less likely to select full compensation. However, preferences for compensation found to be inelastic. Support for supply management was found to be the strongest predictor within the base model. It was estimated that respondents voting to keep supply management were 15 percent more likely to select full compensation than those who did not.

Geography was also a significant predictor of preferred level of compensation. Households in Ontario, Quebec, as well as in rural areas were found to support higher levels of compensation compared to the rest of Canada. If deregulation were to occur, the location of support may play a large role in the amount of compensation provided as 59 percent of the seats in the House of Commons are located in Ontario and Quebec. More importantly, a large share of

the production of supply managed products occurs in marginal riding in Ontario and Quebec, which gives producer concerns a disproportionate amount of influence in federal politics (Trebilcock 2014).

In their latest platforms all major federal parties, except for the People's Party of Canada, support supply management (Bloc Quebecois 2021; Green Party of Canada 2021; Conservative Party of Canada 2021; Liberal Party of Canada 2021; New Democratic Party of Canada 2021).While supported by all parties with seats in the House of Commons, it was found that political orientation was a significant predictor of preferences for compensation. Respondents who indicated support for center-right parties were found to be significantly less likely to support higher level of compensation. However, given the number of federal seats in Ontario and Quebec, and the concentration of production in marginal ridings (Trebilcock 2014), the Conservative Party of Canada still may support higher levels of compensation despite preferences for lower levels of compensation among party supporters.

The Canadian federal government has shown a willingness to compensate producers for the potential loss in the value of quota. Since 2018, $2.6 billion have been paid or promised to dairy producers as a result of increased foreign access to Canadian markets (les Producteurs De Lait Du Quebec 2018; Agriculture and Agri-Food Canada 2019; Bagnoli and Scholz 2021). The precedent for quota buyout programs has also been set in Canada with the 2008 Ontario Flue-Cured Tobacco Growing Marketing Board buyout worth $284 million (Schmitz et al. 2016), and examples of large-scale quota buyouts are present in United States with the tobacco and peanut industries (Dohlman et al. 2009). While significantly larger than the US and Canadian buyback programs, results from this research suggest that a majority of Canadians would be willing to directly pay at least partial compensation if supply management were to be dismantled.

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