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Health Motivation for Purchasing Local Foods in the Southeastern United States

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Health motivation for purchasing local foods in the Southeastern United States

By

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Health motivation for purchasing local foods in the Southeastern United States

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Health motivation is found to be a significant driver of local foods purchase (Maples et al., 2013; Onozaka, Nurse, and McFadden, 2010), yet it remains unclear what specific health aspects determine consumer purchase decisions. We study the specific health factors focusing on six particular diseases: cancer, heart disease, diabetes, obesity, back/joint pain and Alzheimer's/dementia to find out whether a relationship exists between disease incidences and consumer decisions to buy local foods.

We examine two separate decisions of whether and how frequently southeastern consumers buy local foods in a two-step decision framework known as Double Hurdle model. Results indicate that cancer, diabetes, obesity and back/joint pain are statistically significant to purchase foods at farm stands. Findings might help local food sellers and product marketers in the southeastern United States to gain a deeper understanding of how consumers' health background and health concerns affect their choice of local food outlets.

DEDICATION

I would like to dedicate this study to my family, especially to my husband for his unconditional love and tremendous support in every step of my life including this research.

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I am truly thankful to my major advisor Dr. Matthew Interis for his continuous guidance, invaluable time, and great encouragement throughout my study without which this work would not have been possible. I would also like to extend sincere thanks to my committee members Dr. Alba Collart, Dr. Lurleen Walters and Dr. Kimberly Morgan for providing incredible assistance and directing me properly to move forward with my research. I express my gratitude to all the professors, faculties, staffs and my dear friends of Agricultural Economics Department for sharing their great knowledge, cheerful greetings and friendly company.

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CHAPTER I

INTRODUCTION

Background

In general, health motivation is considered a major driver of consumers' food purchasing decisions (e.g., FMI Research & Prevention-Rodale, 2013; Chen et al., 2002; Nayga, Lipinski, and Savur, 1998). Studies show that consumers have become more conscious about health and nutrition over time (Darian and Tucci, 2011), as they seek information on production practices and locations in order to obtain higher quality products (Onozaka and McFadden, 2011). This increasing concern for health may be attributed to a rising prevalence of food-related chronic diseases such as diabetes, obesity, heart disease, cancer etc. among consumers (McFadden and Low, 2012; Darian and Tucci, 2011; Meyerhoefer and Leibtag, 2010).

To examine the issue further, several studies have explicitly incorporated variables that attempt to examine the effect of health concerns on consumer food purchases. For example, Darian and Tucci (2011) studied consumers' preferences for different health-enhancing food attributes such as reducing the risk of heart disease, reducing the risk of arthritis, reducing the risk of cancer, and helping with weight control and nutritional value. Their results showed that high nutritional value plays a vital role to influence consumers' purchase intentions followed by the potential to reduce cancer. Real assurance of reducing the risk of heart disease was another important factor to influence consumers' decision for buying food. Similarly, Nayga, Lipinski, and Savur (1998) investigated the factors that affect consumers' use of nutritional labels while food shopping, while at home, and when comparing nutrients for different brands of the same foods. They found that consumers placed greater importance on nutrition, and on following dietary guidelines while shopping. Those who are on special diets are also more likely to use nutritional labels. To the extent possible, the variables utilized in these studies will be incorporated into our research.

Local food purchases, in particular, appear to be motivated by myriad reasons, much of which seem to center around the consumers' perceptions of whether such foods may address health concerns. Zepeda and Li (2006) noted that consumers often give health and nutrition as reasons for buying local foods. Govindasamy, Italia, and Liptak (1997) pointed out that consumers ranked health value, and absence of pesticides as most important product attributes for local food, among other attributes. Similarly, other studies have included attributes such as perceived safety and quality of locally produced foods (Thilmany, Bond, and Bond, 2008) and perception regarding nutrition and health of local foods (Schneider and Francis, 2005) as health variables, given that consumers rated such attributes as important factors for local food purchases.

Health motivations seem to affect the decision to purchase local food specifically. Zepeda and Leviten-Reid (2004) find that people perceive that local foods have direct benefits to their personal health even though hard science is inconclusive about this fact (Martinez et al., 2010; Vogt and Kaiser, 2008). Similar perception on local foods is found in other studies as well (Maples et al., 2013; Onozaka, Nurse, and McFadden, 2010;

Wolf, Spittler, and Ahern, 2005), which showed that health concern is indeed one of the important reasons for consuming local foods.

Definition of local food

There are no set standards to define local foods, and as such, various studies have utilized different standards to frame the discussion. McFadden (2015) noted that although the 2008 Food, Conservation and Energy Act defines local foods as any foods produced within a radius of 400 miles or in the state where the food was produced, the incorporation of transportation, distance, and jurisdictional criteria into this definition adds to the complexity of characterizing local foods; the latter point was raised in previous work by Low et al. (2015) and Martinez et al. (2010). Zepeda and Li (2006) found consumer research participants defined the term as buying from farmers' markets, buying directly from farmers, and through Community Supported Agriculture (CSA) membership. Other popular definitions include foods within or near one's county or state or even neighboring states (Harris et al. 2000).

According to Low and Vogel (2011), *"whether purchased at a farmers' market or at a nearby grocer, "local food" is an ambiguous characteristic of consumer purchases"* (page 1). Our study defines local foods as foods that are bought directly from farmers at farmers' markets and farm stands. This is fairly consistent with how it is defined in several studies (Hand and Martinez, 2010; Martinez et al., 2010) that focus on the set of marketing channels that are utilized by farmers. Given this definition, the purpose of this study is to determine the significant factors that motivate consumers to buy local food, and to find out whether health motivation is an important factor for such purchases.

Growing interest on local food

There has been growing interest among consumers for buying local foods in the United States (Maples et al., 2013; Thilmany, Bond, and Bond, 2008; Durham, 2007; Zepeda and Li, 2006; Zepeda and Leviten-Reid, 2004). In 2008 direct-to-consumer sales (e.g., farmers' markets, roadside stands, on-farm markets, CSAs) accounted for $877 million (roughly 18.27%) of total food sales in the United States (Maples et al., 2013; Low and Vogel, 2011). U.S. Department of Agriculture[USDA],Agricultural Marketing Service (2014) reported that the number of farmers' markets have increased by 3.6 percent in the last nineteen years, from 1,755 in 1994 to 8,144 in 2013. Reasons for consuming local foods include consumers' beliefs that eating local food are associated with providing healthier alternatives, that it supports local economies, and that it has certain environmental benefits (Rushing and Ruehle, 2013; McFadden, and Low, 2012; Onozaka, Nurse, and McFadden, 2010).

Regarding the first point specifically, whether local foods are in fact healthier than non-local foods remains an empirical question. Salois (2012) suggests that the presence of farms with direct sales, the density of farmers' markets, and the per capita volume of direct farm sales are negatively related to the prevalence of diabetes and obesity. Berning (2012) found that the number of Community Supported Agriculture and Farmers' Market per square mile is associated with lower individual weight outcomes. Other studies have stated that promoting local foods consumption can improve community health outcomes (Thompson et al., 2008; Conner and Levine, 2007). These studies support the idea that increased access to local food outlets positively affects consumers' health. However, it is still unclear whether these results are causal or coincidental. Due to the lack of scientific evidence, it is hard to claim that local foods are healthier. Therefore, there is a need for scientific research that examines the benefits and loss of local foods so that health conscious consumers can clearly understand whether or not their efforts of buying local foods have measurable effects on their personal or family health, if any.

Nonetheless, all fifty states in the United States of America have capitalized on the surge in consumer demand for local foods and created a variety of agricultural branding programs and encouraged state agencies to source food and food products from local producers and processors. The U.S. Department of Agriculture's *Know Your Farmer, Know Your Food (KYF2)* initiative is aimed at strengthening local and regional food systems and supporting critical connections between consumers and farmers (U.S. Department of Agriculture[USDA], Know Your Farmer Know Your Food, 2015), particularly through direct-to-consumer marketing channels (farmers' markets and farm stands). In the Southeastern states analyzed in our study, examples of state branding programs to promote food and food products produced in state include the Make Mine Mississippi, Go Texan, and Georgia Grown programs.

Other programs that promote use of local foods include the U.S. Department of Food and Nutrition Service Farm-to-School program and the Department of Defense (DoD) Fresh Fruit and Vegetable program. The first promotes the use of local fruits and vegetables in school feeding programs including the National School Lunch and School Breakfast Programs (U.S. Department of Agriculture [USDA], Food and Nutrition Service, 2015); while the latter is a bulk purchasing program that allows schools to use USDA Foods entitlement dollars to buy fresh produce. Similarly, USDA has brought different programming efforts such as the WIC Farmers' Market Nutrition Program (FMNP), the Farmers' Market Promotion (FMPP) and Local Food Promotion (LFPP) Programs, the Senior Farmers' Market Nutrition Program (SFMNP), and the Food Insecurity Nutrition Incentive (FINI) to promote foods in the farmers' market (Hamilton, 2005).

Contribution to the literature

In this study, we focus on six particular diseases that a respondent or his family members might have suffered from and see how the illness history of these diseases affects their decision to buy local foods. The diseases are cancer, heart disease, diabetes, obesity, back or joint pain and Alzheimer's or dementia. Findings from existing studies indicate that health motivation can be a significant driver of local foods purchase. However, health motivation is a broad term which does not explain what specific health aspects determine consumer purchase decisions. For example, consumers with a delicate health history might be trying to fend off diseases by purchasing and consuming local foods. To our knowledge, the only closely related paper that addresses family health history to study local food purchase decision is Maples et al. (2013), which includes diseases like cancer, heart disease, diabetes, and obesity of respondent and his family to investigate the incidences of illness. Their results revealed that disease incidence is significantly linked to increased likelihood of buying foods directly from producers. Even though they had data on separate diseases, they aggregated all the diseases in one term, 'family illness incidences', and concluded that family illness incidences is a significant factor for purchasing foods directly from producers. This finding makes the reader unable to see which diseases specifically mattered. Our study clearly demonstrates which diseases in particular among the six, are affecting consumers' buying behavior toward local foods.

We also study how these health factors affect local foods purchasing versus overall food purchasing decision. Darian and Tucci (2011) found that the potential for food to reduce cancer and heart disease are important factors that influence consumers' food purchasing intentions. However, since their study did not focus on local foods specifically, it may be worthwhile to explore whether these concerns affect local food purchases as well.

Another factor that we consider in detail is consumers' motivation to follow a special diet. Zepeda and Li (2006) studied 'following special diet' as an important variable for local foods purchase. However, the reason for following a special diet has not been explicitly studied. Our study explains precisely whether consumers' motivations to follow a special diet is to treat illness or for other reasons such as fitness, or being a vegan or a vegetarian.

Additionally, other specific health factors (lifestyle changes for health reasons, food safety concerns, physical activity level, importance of travel distance of foods, importance of fertilizer use, and pesticide residue on foods) are also explored as factors that potentially motivate local food purchase decisions. We attempt to contribute to the literature by assessing health motivation via specific health variables and studying in depth how each variable affects the choice of purchasing local foods.

Specific question and study context

The main question that our study tries to answer is 'How do specific illness incidences and health concerns affect consumers' decisions to purchase directly from farmers at local food outlets such as farmers' markets and farm stands?' We address this question through an online survey of primary household food shoppers from six Southeastern states (Alabama, Florida, Georgia, Louisiana, Mississippi and, Texas) to elicit information on health factors of consumers who buy local foods. A particular focus is on whether and how frequently Southeastern consumers buy foods at farmers' markets or farm stands analyzing these two separate decisions in a two-step decision framework known as a Double Hurdle model. Our study question is different from the existing literature as respondents were asked to report direct purchases from growers within the past month (our survey was conducted from August 9-26, 2013). Respondents were also asked to indicate whether or not they themselves, or specific family members, had received treatment for these six diseases, as opposed to indicating a health concern or perceived likelihood of contracting the illness in the future- this variable captured self-reported specific disease diagnosis and treatment. Among the diseases, it is expected that consumers with heart disease, diabetes, obesity, and cancer would be more likely to go to farmers' markets or farm stands because, in contrast with back or joint pain and Alzheimer's or dementia, these are diseases that may be more related with diets (WHO and Consultation, 2003).

Importance of the study

The results of this study are important for Southeastern local food growers, sellers, or product marketers, and policymakers to gain a deeper understanding of how consumers' health background and health concerns affect their perception and choice of local food outlets. Sellers and product marketers could become more attuned to specific demands of health conscious consumers, and therefore, to the extent possible, emphasize the health benefits of their local food products. Moreover, the findings of our study could be useful to marketing efforts and agricultural branding programs. They could permit product marketers to better understand motivations and behavioral characteristics of health conscious consumers who purchase local foods, and to therefore stress marketing efforts accordingly. Food market researchers or food industry leaders could also benefit from this study as it offers a broader set of literature establishing the role of health variables on local food purchase decision.

CHAPTER II

SURVEY AND DATA

We use data obtained from an online consumer survey on food buying which was conducted in August 9-26, 2013 to examine the characteristics of southeastern consumers who buy foods from local food outlets such as farmers' markets and farm stands. The six southeastern states considered in our study include Alabama, Florida, Georgia, Louisiana, Mississippi and Texas. We obtained a minimum of 300 respondents from each state. Our survey was administered by Research Now, a market research company based in Plano, TX. In total, 4707 respondents completed the survey. The sample is fairly representative except for age; older age groups in the sample population compared to total population (Table 2.1). This is likely because respondents were screened for adults who are primary food shoppers.

Table 2.1 Survey Respondent Demographics Compared with 2010 U.S. Census Bureau Data by State

		Population	Percent female	Percent white	Age (median years)
AL	Sample	301	56.8	75.08	52
	State	4.77 million	51.5	68.5	37.9
FL	Sample	1061	52.87	77.19	50
	State	18.8 million	51.5	75	40.7
GA	Sample	1327	55.38	65.63	49
	State	9.68 million	51.2	59.7	35.3
LA	Sample	302	51.32	68.87	49.5
	State	4.53 million	51	62.6	35.8
MS	Sample	300	52.33	63.33	48
	State	2.96 million	51.4	59.1	36
TX	Sample	1416	47.03	66.1	46.5
	State	25.14 million	50.4	70.4	33.6

Source: U.S. Census Bureau (http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF)

In the survey, respondents were asked to indicate whether or not they have bought any food at least once in the past month at local food outlets (i.e. farmers' markets and/or farm stands) and, if yes, how many times have they purchased that month in those outlets. These questions are two of the dependent variables used in our study.

We separate farmers' markets from farm stands because of two main differences in terms of their selling locations and operations. For example, farmers' markets are usually located in a common area such as downtown and are operated by several vendors with a wider variety of produces whereas farm stands are usually located nearby the farm and are normally operated by a single farm.

Other health-related questions are asked in the survey as explanatory variables. To elicit information on illness incidences, respondents were given a table (Figure 2.1) and were asked to indicate if they or any of their family members (spouse, siblings, father, mother, children, or grandparents) have been treated for cancer, heart disease, diabetes, back or joint pain, Alzheimer's or dementia and obesity as shown:

Q29. Please check if you or your relatives have been treated for any of the following health issues (check all that apply)

	Me	Spouse	Siblings	Father	Mother	Children	Grandparents
Cancer							
Heart Disease							
Diabetes							
Back/Joint Pain							
Alzheimer's/Dementia							
Obesity							
None of the above							

Figure 2.1 A snapshot of the survey question on the illness incidences

Respondents were also asked whether someone in their household follows a special diet for any of the reasons such as: to treat illness, to keep fit (e.g., for fitness or weight loss), is a vegan or vegetarian and for religious reasons. Their answers were recorded as Yes or No. Similarly, they were asked which of the changes: major changes, minor changes or no changes, have they made in their own lifestyle over the last five years for health reasons. Other health-related question included in the survey was their concern for food safety. For this, they were asked, relative to their friends and family members, how concerned are they about the safety of fresh produce items that are produced in the United States and produced in countries other than the United States as two separate questions. These questions were measured in 5-point Likert scales starting from zero, which denotes 'much less concerned', to four, which denotes 'much more concerned'. Finally, to know the information about respondents' physical activity level, they were asked to choose among three options: less active (an equivalent of less than 1.5 miles of brisk walking daily), active (an equivalent of 1.5-3 miles of brisk walking daily), or more active (an equivalent of more than 3 miles of brisk walking daily) whichever category they consider themselves to belong to.

Apart from health-related questions, respondents were asked to denote the number of times they go food shopping per month and the number of meals prepared at home per week, in order to know more about their shopping and cooking frequency. The more frequently they shop and cook food, the more purchases they might make at their nearby local outlets such as farmers' markets and farm stands. Similarly, to elicit information on travel habits, they were asked to indicate the average number of days per month spent on travel for work or pleasure. We assume more travel habits might also increase consumers' likelihood of going out and purchasing foods from those markets. Questions related to buying behavior were also asked in the survey. For example, respondents were asked, relative to their friends and family members, how concerned are they about the average prices of fresh produce items they will purchase in the next six months. This question was also measured in 5-point Likert scales starting from zero, which denotes 'much less concerned', to four, which denotes 'much more concerned'. We also asked seven true/false questions regarding U.S. fruit and vegetable production to find out whether or not having higher agricultural knowledge of the consumers increases their purchases at farmers' markets and farm stands (Table 2.2).

Table 2.2 True/False questions about U.S. agricultural production

Q no.	Agricultural Questions
1	One-half of all U.S. fruit acreage is located in California.
2	Fresh fruit and vegetables grown in the Southern U.S. are more susceptible to insect and plant diseases compared to Northern or Western production zones.
3	For every $1.00 U.S. consumers spend on fresh fruits and vegetables, the U.S. farmer receives greater than one-third of that dollar.
4	The 2011 Food Safety Modernization Act was established to provide a legislative mandate to require comprehensive, science-based preventive controls across the food supply.
5	An acre of fresh tomatoes typically requires more water than is needed to produce an acre of wheat.
6	Rinsing fresh fruits and vegetables with water removes all chemical and bacterial residues.
7	All farmers' market managers are required to certify that their vendors sell only the fruits and vegetables grown on their own farm.

Note: Three options (True, False, and Not Sure) were given for each of these questions.

Furthermore, respondents' environmental concern was obtained by asking them to indicate their agreement level (3= agree, 2= neither agree nor disagree, 1= disagree) to five statements [1] regarding the foods they purchase.

Abello et al. (2014) found the negative effect of farmers' markets' distance on the consumers' number of visits to such markets indicating the importance of farmers' markets location on food purchasing decision. Hence, we think that the availability of

[1] The five statements mentioned in the survey are as follows:

1. The number of miles that my tomatoes travel from where they're grown to where I buy them is important to me
2. The amount of water was used to grow a pound of tomatoes that I buy is important to me
3. The use of petroleum-based fertilizer to grow the tomatoes that I buy is important to me
4. The amount of pesticide residue on the tomatoes that I buy is important to me
5. The price per pound of tomatoes that I buy is important to me

farmers' markets or farm stands near respondents' zip codes, might also affect local food buying behavior; however, this information was missing in our survey questionnaire. Therefore, we used U.S. Department of Agriculture, National Count of Farmers Market Directory Listing Graph (2014), to find out the number of farmers' markets within 5 miles of the respondent's zip code. This website is updated in every two business days but has no information of farm stands. So we used Localharvest, Inc. (2014), an organization which provides nationwide opportunity for farm stands to register on their website, to collect data on farm stands. From this website we obtained counts of the number of farm stands available within 15 miles of respondents' zip codes. Using collected data, we develop an approximation of farmers' markets within 5 miles and farm stands within 15 miles of the respondents' zip codes by State (Table 2.3).

Demographic variables included in the survey are gender, age, education (respondents were asked to indicate the highest level of education that they have completed among six choices starting from non-graduated high school to graduate or professional degree), race (respondents were asked to indicate their races among given race-types such as Black or African American, American Indian or Alaska native, Asian or Asian American, White, etc.), U.S. born (whether or not born in the U.S.), number of people in the household and income (categories of income ranges were given, the minimum value being less than $10,000 and the maximum value being more than $500,000).

Table 2.3 Average Count of Farmers' Markets (FMs) and Farm Stands (FSs) by State

	AL	FL	GA	LA	MS	TX
FMs within 5 miles of respondents' zip codes (Avg.)	1.70	1.60	1.93	2.11	0.91	1.43
FSs within 15 miles of respondents' zip codes(Avg.)	6.32	10.78	21.70	2.07	2.53	8.80

All the above mentioned survey questions were asked exactly as reported, however, some of those variables are used differently in the models in order to fit into our study context that can give a more clear meaning to the results. The variables used in the models are summarized in Table 2.4.

Table 2.4 Variables used in the models

Variable	**Type**
Dependent variables	
Whether or not the respondent has bought any food at least once in the past month at farmers' markets	Binary
How many times in the last one month has he purchased any food from farmers' markets	Continuous
Whether or not the respondent has bought any food at least once in the past month at farm stands	Binary
How many times in the last one month has he purchased any food from farm stands	Continuous
Independent variables (Health variables)	
Whether or not the respondent, his spouse or his children have been treated for cancer	Binary
Whether or not his siblings, parents or grandparents have been treated for cancer	Binary
Whether or not the respondent, his spouse or his children have been treated for heart disease	Binary
Whether or not his siblings, parents or grandparents have been treated for heart disease	Binary
Whether or not the respondent, his spouse or his children have been treated for diabetes	Binary

Table 2.4 (continued)

Whether or not his siblings, parents or grandparents have been treated for diabetes	Binary
Whether or not the respondent, his spouse or his children have been treated for obesity	Binary
Whether or not his siblings, parents or grandparents have been treated for obesity	Binary
Whether or not the respondent, his spouse or his children have been treated for back or joint pain	Binary
Whether or not his siblings, parents or grandparents have been treated for back or joint pain	Binary
Whether or not the respondent, his spouse or his children have been treated for Alzheimer's or dementia	Binary
Whether or not his siblings, parents or grandparents have been treated for Alzheimer's or dementia	Binary
Concerned about international food safety (0= much less concerned, 4= much more concerned)	Continuous
Does the respondent exercise an equivalent of 1.5-3 miles of brisk walking daily?	Binary
Does the respondent exercise an equivalent of more than 3 miles of brisk walking daily?	Binary
If someone in the household follows a special diet to treat illness	Binary
If someone in the household follows a special diet to keep fit	Binary
If someone in the household follows a special diet being vegan or vegetarian	Binary
Independent variables (Other variables)	
Are there farmers' markets within 5 miles of the respondent's zip code?	Binary
Are there farm stands within 15 miles of the respondent's zip code?	Binary
Is the number of miles that tomatoes travel from production location to selling location important to the respondent?	Binary
Is the amount of pesticide residue on the tomatoes that the respondent buy is important to him?	Binary
Is the price per pound of the tomatoes that the respondent buy is important to him?	Binary
Number of times the respondent shops for food per month	Continuous
Number of days the respondent travels per month for business or pleasure	Continuous
Number of correct answers on agricultural knowledge quiz	Continuous
Number of meals prepared at home per week	Continuous
Whether the respondent is female	Binary

Table 2.4 (continued)

Respondent's annual household income in 2012 (measured in $1000s)	Continuous
Age of the respondent	Continuous
Has the respondent completed at least a bachelor's degree?	Binary
Number of people living in the respondent's household	Continuous
Whether the respondent is white	Binary
Was the respondent born in the U.S.	Binary

Note: Binary variable is equal to 1 if the variable description is true, 0 otherwise
An exercise equivalent of less than 1.5 miles of brisk walking daily is the omitted base category

CHAPTER III

THEORETICAL MODEL

We study how health factors affect two separate consumer decisions of local food purchases. The first decision is whether or not to buy foods direct from the growers at outlets such as farmers' markets or farm stands, and the second decision is how many times to purchase foods from those outlets.

Hypotheses

We have two main hypotheses in this study. One relates to the specific illness incidences in the family and the other to the health concerns of the consumers as follows:

1) If any family member (respondent, spouse, siblings, father, mother, children, grandparents) has been treated for cancer, heart disease, diabetes, obesity, back/joint pain or Alzheimer's/dementia, it should increase respondents' likelihood of purchasing foods at farmers' markets or farm stands and should also increase their frequency of purchase at those markets.

2) Respondents who are more concerned about food safety, who follow special diet to treat illness, who exercise more, and who have made major changes in their lifestyle because of health reasons should be

more likely to buy foods at farmers' markets or farm stands and should buy more frequently at those markets.

Random Utility Theory

This study uses a random utility framework (McFadden, 1974), which assumes utility has two components: a deterministic component for consumers and a random component which is non-observable to the researcher. We assume that utility is linear in unknown parameters such that the utility from choosing whether or not to shop at local food outlets (i.e. farmers' markets or farm stands) is:

$$u_{ic} = V_{ic} + \varepsilon_{ic} \tag{3.1}$$

where u_{ic} is the utility of respondent i from making choice c. The choice $c \in \{1, 0\}$ indicates the choice of buying local foods (1) or not (0). V_{ic} is the deterministic component of the utility of an individual i from making choice c. It can be expressed as:

$$V_{ic} = \mathbf{x}_i^{'}\boldsymbol{\beta}_{xc} \tag{3.2}$$

where $\mathbf{x}_i^{'}$ is a vector of characteristics of an individual i such as health concern, history of family illness, food safety concern, perceptions of local foods quality etc. as well as socio-demographic characteristics such as gender, age, family size, income, education etc. $\boldsymbol{\beta}_{xc}$ is a vector of parameters to be estimated. From equation (3.1) and (3.2) the utility can be expressed as:

$$u_{ic} = \mathbf{x}_i^{'}\boldsymbol{\beta}_{xc} + \varepsilon_{ic} \tag{3.3}$$

where ε_{ic} is the random component of the utility of an individual i from making choice

Based on random utility theory, a rational consumer buys from local food outlets if and only if the utility he derives from buying at these outlets is greater than the utility derived from non-local food outlets (e.g. grocery store). Because we cannot observe the error term ε_{ic}, we can only make a probability statement regarding individuals' choice among many alternatives. So, for an individual i, the probability of buying local foods is:

$$\begin{aligned} \Pr(c=1) &= \Pr(u_{i1} \geq u_{i0}) \\ &= \Pr(u_{i1} - u_{i0} \geq 0) \end{aligned} \tag{3.4}$$

The absolute value of utility alone does not provide economic meaning; rather, the differences matter because individual preferences are revealed through ranking of the decisions. If he chooses to buy foods directly from the grower (1) over purchasing foods through non-direct channels (0), it implies that his utility is greater for choosing to buy foods directly from the grower. So, it is not important to know how *much* utility he gains from each choice, rather it is important to know *which* of the choices gives him the highest utility.

From equation (3.4), we have

$$\begin{aligned} \Pr(c=1) &= \Pr(u_{i1} - u_{i0} \geq 0) \\ &= \Pr((\mathbf{x}_i'\boldsymbol{\beta}_{x1} + \varepsilon_{i1}) - (\mathbf{x}_i'\boldsymbol{\beta}_{x0} + \varepsilon_{i0}) \geq 0) \\ &= \Pr(\mathbf{x}_i'(\boldsymbol{\beta}_{x1} - \boldsymbol{\beta}_{x0}) + (\varepsilon_{i1} - \varepsilon_{i0}) \geq 0) \end{aligned} \tag{3.5}$$

Let $u_i^* = u_{i1} - u_{i0}$, $\boldsymbol{\beta}_x^* = \boldsymbol{\beta}_{x1} - \boldsymbol{\beta}_{x0}$ and $\varepsilon_i^* = \varepsilon_{i1} - \varepsilon_{i0}$. Then we have,

$$u_i^* = \mathbf{x}_i'\boldsymbol{\beta}_x^* + \varepsilon_i^* \tag{3.6}$$

Different assumptions on the distribution of the error term ε_i^* gives rise to different models such as the probit model, logit model etc. We assume the error term to be independently and identically distributed (i.i.d) with normal distribution which is the probit model. With this assumption, the differences in parameters across choices $(\boldsymbol{\beta}_x^* = \boldsymbol{\beta}_{x1} - \boldsymbol{\beta}_{x0})$ can be estimated using a maximum likelihood estimator (Greene, 2008).

In our study, we look at two separate decisions of whether or not to buy foods directly from the grower and how often to buy them. Generally used models for such cases are the tobit and the double-hurdle models (Gao, Wailes, and Cramer, 1995). The main difference between these two models is that a tobit model would assume that the factors affecting whether to purchase at farmers' markets or farm stands and how often to purchase have the same effect on these two decisions, whereas a double hurdle model allows these effects to differ. Since we expect that these decisions could be determined by different sets of factors, we specify a double-hurdle model for our study. If our health variables are indeed factors that affect the consumer's decision to purchase local food -- as defined in the context of our study -- we would expect the parameters on those variables to be statistically significant.

Double-hurdle Model

A double-hurdle model is a modified count data model which relaxes the assumption that the zeros (whether or not there are purchases) and positives (how many purchases) come from the same data generating processes (Cameron and Trivedi, 1998). If the realization is positive, the hurdle is crossed, and the conditional distance of the positives is governed by a truncated-at-zero count data model (McDowell, 2003). In our model, the first hurdle represents whether or not consumers buy food at farmers' markets or farm stands (probit model) and the second hurdle represents how often they buy (truncated-at-zero Poisson model), given that they buy at least once. Hence, we specify a probit-Poisson double-hurdle model to account for both decisions.

Probit-Poisson Double-hurdle model specification

In a double-hurdle model, the likelihood function (the likelihood that the estimates of the parameters could be used to predict the observed outcomes) can be separated with respect to the parameters to be estimated. This allows to represent the double-hurdle model as the sum of two separate steps: a binomial probability model (Step 1), and a truncated-at-zero count model

(Step 2). The binomial process determines whether the dependent variable Y takes a value of zero ($y_i = 0$) or positives ($y_i = 1, 2, 3, \ldots$). The probability mass function (PMF) of a double hurdle model can be specified as follows:

$$\Pr(Y = y_i) = \begin{cases} \pi & y_i = 0 \\ 1 - \pi & y_i = 1, 2, 3, \ldots \end{cases} \tag{3.7}$$

Step 1

The first hurdle models participation decision, i.e. whether or not to purchase at farmers' markets or farm stands. In our study, it is represented by a probit model interrelated with a latent dependent variable as follows:

$$c = \begin{cases} 0 & \text{if } \; u_i^* \le 0 \Rightarrow \text{if } \; \mathbf{x}_i' \boldsymbol{\beta}_x^* + \varepsilon_i^* \le 0 \\ 1 & \text{if } \; u_i^* > 0 \Rightarrow \text{if } \; \mathbf{x}_i' \boldsymbol{\beta}_x^* + \varepsilon_i^* > 0 \end{cases} \quad \varepsilon_i^* \sim N(0, \sigma^2) \tag{3.8}$$

where c is a binary dependent variable indicating an individual's choice of buying foods direct from the grower (1) or not (0); u_i^* is a latent dependent variable; $\mathbf{x}_i^{'}$ is a vector of explanatory variables (health variables, demographics variables etc.); $\boldsymbol{\beta}_x^*$ is a vector of coefficients of the explanatory variables and ε_i^* is a normal random component.

For an individual i, the probability of buying local foods is (equation 3.5)

$$\begin{aligned} \Pr(c=1) &= \Pr(\mathbf{x}_i^{'}\boldsymbol{\beta}_x^* + \varepsilon_i^* \geq 0) \\ &= \Pr(\varepsilon_i^* \geq -\mathbf{x}_i^{'}\boldsymbol{\beta}_x^*) \end{aligned} \tag{3.9}$$

The probability that ε_i^* is greater than or equal to $-\mathbf{x}_i^{'}\boldsymbol{\beta}_x^*$ is the same as saying ε_i^* is less than $-\mathbf{x}_i^{'}\boldsymbol{\beta}_x^*$ when subtracted from the total probability of 1 as shown:

$$\begin{aligned} \Pr(c=1) &= 1 - \Pr(\varepsilon_i^* < -\mathbf{x}_i^{'}\boldsymbol{\beta}_x^*) \\ &= 1 - \Pr(-\mathbf{x}_i^{'}\boldsymbol{\beta}_x^* > \varepsilon_i^*) \end{aligned} \tag{3.10}$$

We assume that the error term ε_i^* is normally distributed. Because the normal distribution is symmetric, it is true that F(x) = 1 − F(− x) (Haab and McConnell, 2002) and thus the equation 3.10 can be rewritten as:

$$\begin{aligned} \Pr(c=1) &= \Pr(\mathbf{x}_i^{'}\boldsymbol{\beta}_x^* > \varepsilon_i^*) \\ &= \Pr(\varepsilon_i^* < \mathbf{x}_i^{'}\boldsymbol{\beta}_x^*) \end{aligned} \tag{3.11}$$

Haab and McConnell (2002) mentioned that to use typical software packages such as SAS, STATA, LIMDEP etc., the normal error term $\varepsilon_i^* \sim N(0,\sigma^2)$ needs to be converted to a standard normal term i.e. $\varepsilon_i^* \sim N(0,1)$. To convert to the standard normal, the error term should be divided by a standard deviation σ (Haab and McConnell, 2002).

Let $\theta = \frac{\varepsilon_i^*}{\sigma}$. Then $\theta \sim N(0,1)$ and we have

$$\Pr(\varepsilon_i^* < \mathbf{x}_i'\boldsymbol{\beta}_x^*) = \Pr(\frac{\varepsilon_i^*}{\sigma} < \frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma})$$
$$= \Pr(\theta < \frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}) \qquad \theta \sim N(0,1) \tag{3.12}$$

Let Φ_θ be the standard normal cumulative distribution function of the error term, which is the probability of the random variable with normal distribution, the equation 3.12 can be written as:

$$\Pr(c=1) = \Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right) \tag{3.13}$$

The probability of not buying foods directly from the grower is:

$$\Pr(c=0) = 1 - \Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right) \tag{3.14}$$

Therefore, the PMF for the probit model is:

$$\Pr(Y=c) = \begin{cases} 1 - \Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right) & c = 0 \\ \Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right) & c \neq 0 \end{cases} \tag{3.15}$$

where Y is a dependent variable (i.e. the decision of whether or not to buy local foods) and c is the realization of the dependent variable (i.e. the choice of buying foods direct from the grower or any other foods among all the available choices).

Step 2

The second hurdle models the count decision, i.e. how many times individuals bought at farmers' markets or farm stands. The probability that the dependent variable Y, conditional on non-zero observations, will be equal to a certain number y_i is modeled by a zero-truncated Poisson process. In the Poisson regression, it is the count variable itself that is distributed Poisson, not the error term (Lavery, 2010).

The Poisson model has PMF:

$$\Pr(Y = y_i | Y \neq 0) = \begin{cases} 0 & otherwise \\ \dfrac{\lambda^{y_i}}{(e^{\lambda} - 1) y_i !} & y_i = 1, 2, 3, \ldots \end{cases} \quad (3.16)$$

where λ (lambda) is the intensity or rate parameter which represents the expected number of purchase frequency in a fixed period of time which is one month in our study. Unlike the familiar normal distribution, which takes two parameters (mean and variance), the Poisson distribution only takes one parameter, λ ,which describes the mean and the variance (Lavery, 2010).

Bayes' rule shows the relation between two events by calculating the probability of a prior event, given the result of the subsequent event. Two events in our study are two decisions of whether or not to buy local foods and how frequently to buy them. Using Bayes' rule, we can combine the ratio of the probabilities of the two decisions (equation 3.15 and equation 3.16).

Therefore, the unconditional PMF for Y is given by:

$$\Pr(Y=c=y_i)=\begin{cases}1-\Phi_\theta\left(\dfrac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right) & c=0\\ \Phi_\theta\left(\dfrac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\dfrac{\lambda^{y_i}}{(e^\lambda-1)y_i!} & y_i=1,2,3,...\end{cases} \tag{3.17}$$

Likelihood function

The likelihood function of a probit-Poisson double-hurdle model can be specified for all respondents (i) as (Mullahy, 1986):

$$L=\prod_{i|c=0}\left[1-\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right]\prod_{i|c>0}\left[\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right]\prod_{i|y_i>0}\left[\frac{\lambda^{y_i}}{(e^\lambda-1)y_i!}\right] \tag{3.18}$$

Let $\lambda=e^{x_i'\boldsymbol{\alpha}_x}$ which is a usual choice for λ (Wooldridge, 2010) and $\boldsymbol{\alpha}_x$ represents a vector of parameters to be estimated for the second decision (Poisson model).

$$L=\underbrace{\prod_{i|c=0}\left[1-\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right]\prod_{i|c>0}\left[\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right]}_{first\ term}\underbrace{\prod_{i|y_i>0}\left[\frac{e^{y_i x_i'\boldsymbol{\alpha}_x}}{(e^{e^{x_i'\boldsymbol{\alpha}_x}}-1)y_i!}\right]}_{second\ term} \tag{3.19}$$

The first term represents the probit estimator and the second term represents the Poisson estimator.

Since the likelihood function for the double hurdle model is separable with respect to the parameter vectors $\boldsymbol{\beta}_x^*$ and $\boldsymbol{\alpha}_x$, the log likelihood can be represented as the sum of two separate models -- A probit model and a truncated-at -zero Poisson model as follows:

$$\ln L = \ln\left\{\underbrace{\prod_{i|c=0}\left[1-\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right]\prod_{i|c>0}\left[\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right]}_{first\ term}\underbrace{\prod_{i|y_i>0}\left[\frac{e^{y_i x_i'\boldsymbol{\alpha}_x}}{(e^{e^{x_i'\boldsymbol{\alpha}_x}}-1)y_i!}\right]}_{second\ term}\right\} \quad (3.20)$$

$$\ln L = \left\{\sum_{i|c=0}\ln\left(1-\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right)\right\}+\left\{\sum_{i|c>0}\ln\left(\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right)\right\}+\left\{\sum_{i|y_i>0}\ln\left[\frac{e^{y_i x_i'\boldsymbol{\alpha}_x}}{(e^{e^{x_i'\boldsymbol{\alpha}_x}}-1)y_i!}\right]\right\} \quad (3.21)$$

$$\ln L = \underbrace{\left\{\sum_{i|c=0}\ln\left(1-\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right)\right\}+\left\{\sum_{i|c>0}\ln\left(\Phi_\theta\left(\frac{\mathbf{x}_i'\boldsymbol{\beta}_x^*}{\sigma}\right)\right)\right\}}_{\text{Probit model}} + \underbrace{\left\{\sum_{i|y_i>0}y_i x_i'\boldsymbol{\alpha}_x-\sum_{i|y_i>0}\ln(e^{e^{x_i'\boldsymbol{\alpha}_x}}-1)-\sum_{i|y_i>0}\ln(y_i!)\right\}}_{\text{Poisson model}} \quad (3.22)$$

As indicated in the equation 3.22, vectors of parameters $\boldsymbol{\beta}_x^*$ and $\boldsymbol{\alpha}_x$ are separable as captured by two separate models: the probit model and the truncated-at-zero Poisson model, respectively. This separable nature implies that the covariance between $\boldsymbol{\beta}_x^*$ and $\boldsymbol{\alpha}_x$ are zero and thus, without loss of information, we can fit the double-hurdle model by estimating the parameters of the probit model $\boldsymbol{\beta}_x^*$ separately from the parameters of the truncated-at-zero Poisson model $\boldsymbol{\alpha}_x$ (McDowell, 2003).

Finally, $\boldsymbol{\beta}_x^*$ and $\boldsymbol{\alpha}_x$ can be estimated using a maximum likelihood estimator which estimates the parameters by finding the value of the parameters that maximizes the log-likelihood function of the two models separately as follows:

$$\begin{aligned}&\underset{\beta}{Max}\ E[\ln L(\boldsymbol{\beta}_x^*)]\\&\underset{\alpha}{Max}\ E[\ln L(\boldsymbol{\alpha}_x)]\end{aligned} \quad (3.23)$$

where $\ln L(\boldsymbol{\beta}_x^*)$ is the log-likelihood function of the probit model and $\ln L(\boldsymbol{\alpha}_x)$ is the log-likelihood function of the truncated-at-zero Poisson model.

Endogeneity model check

We hypothesize that the disease incidences affect whether a respondent buys foods at farmers' markets or farm stands, but the pattern could be reverse, i.e. buying at those markets could affect the diseases incidences (reverse casualty). Such reverse casual effect could be more prominent to 'obesity' which is caused mainly because of excess intake of unhealthy foods and inadequate exercises (USDHHS, 2003). Therefore, we suspected that obesity might be correlated with the decision to purchase at local markets. This possibility might create a problem of endogeneity in the estimation model as illustrated below:

$$\begin{aligned} u_i^* &= \left(\mathbf{x}_i'\boldsymbol{\beta}_x^*\right)^{-\beta_2} + obesity\,\beta_2 + \varepsilon_i^*, \quad c = 1 \text{ if } u_i^* > 0 \\ obesity &= \mathbf{z}_i'\gamma_z^* + v_i^* \end{aligned} \qquad (3.24)$$

Note: $\left(\mathbf{x}_i'\boldsymbol{\beta}_x^*\right)^{-\beta_2}$ excludes the explanatory variable *obesity* and the associated parameter β_2.

where, c is a binary variable indicating the choice of buying local foods (1) or not (0). The *obesity* variable is also a binary variable indicating that the respondent or any other member in the family has been treated for obesity (1) or not (0) which is a function of instrumental variable $\mathbf{z}_i$ for an individual i. There might be a correlation between *obesity* and ε_i^* stemming from the correlation of v_i^* and ε_i^*, which if true, the probit estimation is not appropriate to estimate consistent coefficients, $\boldsymbol{\beta}_x^*$ and β_2 (Greene, 2007). Using an instrumental variable (IV) is one of the solutions to correct for endogeneity. Nonetheless, before correcting for endogeneity, it is important to be sure if there is indeed an endogeneity problem in the model. Widely used tests are two-step instrumental variable probit model, and Newey's (1987) minimum chi-squared estimator, both of which assume continuous endogenous regressors whereas our model has binary endogenous regressor, if confirmed. So, we used two other approaches to check whether or not there is endogeneity in the model.

First approach

The first approach is used to find out whether there is a correlation between the regressor i.e. obesity, and the error term. The idea behind this approach is to use a maximum likelihood estimator of a binary outcome, assuming there is an endogenous regressor (obesity) which is also binary, and to estimate a bivariate probit model. The intention of this approach is to compare the results of the bivariate probit model with the results of the binary probit model to check the correlation parameter between two models (Wooldridge, 2010).

The conceptual model for bivariate probit for the decision to buy foods at farmers' markets is:

$$FM = \left(\mathbf{x}_i'\boldsymbol{\beta}_x^*\right)^{-\beta_2} + obesity\beta_2 + \varepsilon_i^* \tag{3.25}$$

$$obesity = \mathbf{z}_i'\gamma_z^* + obeseP\gamma_2 + obeseS\gamma_3 + v_i^* \tag{3.26}$$

where, FM is a binary variable indicating the choice of buying at farmers' markets (1) or not (0) and $obesity$ is also a binary variable indicating that the respondent or any other member in the family has been treated for obesity (1) or not (0). $obeseP$ and $obeseS$ are binary variables, used as instrumental variables, indicating whether the respondent has obese parents (1) or not (0) and obese siblings (1) or not (0), respectively. Since obesity could also be caused due to genetic reason, having obese parents or obese siblings can be associated with having obesity in the respondent as well. However, such genetic disease is assumed not to affect the decision of the respondent to go to farmers' markets because the respondent, who is a primary food shopper of his family, is assumed not to be responsible for feeding his parents and siblings (for treatment of obesity) who are not the part of his household. Here, we are assuming that the respondent's household consists of himself, his spouse and his children and do not include his parents and siblings. Therefore, we used obese parents and obese siblings as instrumental variables which are correlated with obesity of respondent, but not with visiting farmers' markets which is how an instrumental variable is supposed to be defined. If obesity is actually endogenous, the correlation coefficient between the bivariate outcomes is expected to be statistically significant. We used the same estimation process for farm stands as well.

The results from the bivariate probit model are found to be almost identical to those from the binary probit model for both markets i.e. farmers' markets and farm stands. The correlation coefficient between two error terms of the bivariate outcomes is -0.067 and not significant for farmers' markets and for the farm stands it is found to be -0.144 and not significant. This gives us some indication that endogeneity might not be a problem in our model, at least for reverse causation, assuming our instruments are valid.

Second approach

Omitted variable bias is one among multiple reasons that gives rise to the endogeneity problem in the model. Therefore, we also checked if there is endogeneity caused from omitted variable bias in our model. For this, we started with a simple specification of a model where we just included six diseases and other exogenous variables which we know are exogenous, such as demographic variables. Then, we started adding other regressors such as food safety concern and lifestyle change for the second model, physical activity level and special diet for the third model, environmental concern for the fourth model and remaining variables (shopping and cooking frequency, agricultural knowledge and travel habit) for the last model. Thus, we have five different models. Then, we compared the results of these five models and found that obesity has same sign and significance across all the models for both markets. If there was an issue of endogeneity due to omitted variable bias, then we would not have gotten consistent results as we did for obesity throughout all the five models. This indicates there might not be an endogeneity issue, omitted variable being the reason.

Since both approaches do not show any indication of endogeneity in our model, we proceeded using binary probit model for the first decision (whether or not to buy foods from farmers' markets or farm stands) of the double-hurdle model as explained earlier in this chapter.

CHAPTER IV

RESULTS AND DISCUSSION

Descriptive results

Variable descriptive statistics are exhibited in Table 4.1. It should be noted that each of the six diseases (cancer, heart disease, diabetes, back or joint pain, Alzheimer's or dementia and obesity) is studied separately into two groups. The first group includes respondent, spouse and children and the second group includes respondents' siblings, parents and grandparents for each of the diseases. We assume that a respondent's household consists of himself, his spouse and his children. Therefore, such group division between household and non-household allows us to see clearly how the respondent behave while making food purchasing decision when he has an experience of illness history of household versus non-household. It helps us to understand whether consumers' decision to purchase local would be different when different family members have diseases or would it be the same no matter who is affected in the family.

Overall, survey respondents indicated that slightly more than half of the respondents have illness incidences of diseases in the family; i.e. 54 percent of the respondents indicated that one or more members (respondent, spouse, children, siblings, parent, grandparent) in their family have been treated with cancer, 51 percent have been treated with heart disease, 52 percent have been treated with diabetes and 56 percent have been treated with back or joint pain. The percentages were lower for Alzheimer's or dementia (25 percent) and obesity (27 percent). Relative to respondents' friends and family, 65 percent of them are more concerned about the safety of foods grown in the U.S. and 74 percent are more concerned about the safety of the foods grown in countries other than the United States. 46 percent of the respondents consider themselves to be less active (less than 1.5 miles of brisk walking daily), 42 percent to be active (1.5-3 miles of brisk walking daily), and 12 percent to be more active (greater than 3 miles of brisk walking daily). 30 percent of the respondents indicated someone in the family follows a special diet to treat illness, 53 percent to keep fit, 8 percent being vegan or vegetarian and 5 percent for religious reason.

Table 4.1 Variable Definitions and Descriptive Statistics (N=4706)

Variable	**Mean**	**s.d**	**Min**	**Max**
Dependent variables				
Has purchased at farmers' markets at least once within the past month	0.498	0.500	0	1
Number of times food purchased at farmers' markets in past month	1.124	2.026	0	50
Has purchased at farm stands at least once within the past month	0.307	0.461	0	1
Number of times food purchased at farm stands in past month	0.581	1.305	0	25
Independent variables(Health variables)				
Respondent, spouse, or child treated: cancer	0.129	0.336	0	1
Sibling, parent, or grandparent treated: cancer	0.482	0.500	0	1
Respondent, spouse, or child treated: heart disease	0.107	0.310	0	1
Sibling, parent, or grandparent treated: heart disease	0.465	0.499	0	1
Respondent, spouse, or child treated: diabetes	0.164	0.370	0	1
Sibling, parent, or grandparent treated: diabetes	0.426	0.495	0	1
Respondent, spouse, or child treated: obesity	0.168	0.374	0	1
Sibling, parent, or grandparent treated: obesity	0.169	0.375	0	1
Respondent, spouse, or child treated: joint pain	0.383	0.486	0	1
Sibling, parent, or grandparent treated: joint pain	0.329	0.470	0	1

Table 4.1 (continued)

Respondent, spouse, or child treated: Alz/dementia	0.009	0.094	0	1
Sibling, parent, or grandparent treated: Alz/dementia	0.236	0.425	0	1
Concerned about international food safety	3.118	0.994	0	4
Exercises: equivalent of 1.5-3 mile walk per day	0.419	0.493	0	1
Exercises: equivalent of 3+ mile walk per day	0.116	0.320	0	1
Family member follows diet to treat illness	0.302	0.459	0	1
Family member follows diet to keep fit	0.528	0.499	0	1
Family member is vegetarian or vegan	0.075	0.264	0	1
Independent variables(Other variables)				
Farmers' markets within 5 miles	0.659	0.474	0	1
Farm stands within 15 miles	0.964	0.187	0	1
Cares about distance food travels	0.373	0.484	0	1
Cares about pesticide residue on food	0.738	0.440	0	1
Cares about price of food	0.702	0.458	0	1
Number of times respondent shops for food per month	6.309	5.306	1	9 +
Number of days respondent travels per month	8.184	3.867	0	21 +
Number of correct answers on agri. knowledge quiz	2.365	1.581	0	7
Number of meals prepared at home per week	12.943	4.412	0	19 +
Respondent is female	0.521	0.500	0	1
Annual household income ($1000s)	71.129	61.236	10	500
Age	47.937	16.008	18	108
Respondent has bachelor's degree	0.547	0.498	0	1
Number of people in respondent's household	2.567	1.281	0	14
Respondent is white	0.693	0.461	0	1
Respondent is born in the U.S.	0.885	0.319	0	1

Estimation results

A double-hurdle model was estimated using Stata/SE 13.1 software. We used two separate double-hurdle models for two local markets: farmers' markets and farm stands. Parameter estimates are reported in Table 4.2 and Table 4.3 for farmers market and farm stands, respectively. Overall, both the models are good fit as indicated by the P value (i.e. <0.01) for likelihood ratio (LR) tests, given that the assumptions of normality and homoscedasticity of error terms are not violated. Parameter estimates in the probit model indicate how health variables as well as other variables affect the likelihood of consumers' buying foods at farmers' markets or farm stands. Meaning, if the parameter estimate is positive (negative) it indicates the increased (decreased) likelihood of local food purchase when the associated explanatory variable increases (decreases) by one unit. For Poisson model the coefficients of parameter estimates indicate how those variables influence the frequency of purchase at those local outlets. Meaning, if the parameter estimate is positive (negative) with a certain value, it indicates increased (decreased) number of purchases by that value in percentage. We used the same explanatory variables for both purchase and frequency of purchase decisions.

Estimation results for farmers' markets (Table 4.2)

Health variables:

Among six diseases, none of them, except cancer, is found to have significant effect on first decision of whether to buy foods at farmers' markets. Cancer has significantly negative relationship in both decisions. Meaning, if the respondents' siblings, parents or grandparents have been treated with cancer, he is less likely to visit farmers' markets and also likely to buy less frequently at the market given that he went to buy at least once in the past month. Two other diseases (heart disease and obesity) are found to be negatively related with the second decision of how often to purchase. So, if respondents' siblings, parents or grandparents have been treated for heart disease or obesity, he is likely to buy less frequently at the farmers' markets. If the respondent himself or his spouse or his children has a history of back or joint pain, he is likely to purchase foods at the farmers' markets less frequently. An opposite result is found about back or joint pain disease when it comes to respondents' siblings or parents or grandparents; i.e. if any of them have been treated with back or joint pain, then he is likely to buy more frequently at the farmers' markets. Obesity is found to have positive significant relationship in second decision; i.e. if respondent or spouse or children have incidences of obesity, he is likely to buy foods at farmers' markets more frequently.

Apart from diseases, most of the other health variables are found to have positive and significant effect on both decisions of whether to buy and how often to buy foods at the farmers' markets. For example, those who are more concerned, as compared to friends and families, about food safety for the foods grown outside of the United States, are more likely to visit as well as likely to buy more frequently at the farmers' markets. This result seems reasonable in a sense that consumers think that other countries might not have strict rules and regulations for the processing and chemicals use of agricultural foods (Loureiro and Umberger, 2005). Respondents who consider themselves active (i.e. walks 1.5 miles to 3 miles a day) and more active (i.e. walks more than 3 miles a day) have positive effect in both decisions, relative to those who consider themselves as less active (i.e. walks less than 1.5 miles a day). Following special diet to treat illness is not found to have a significant effect on either of the two decisions. Nevertheless, it is found that the likelihood of buying foods increases when the respondent follows a special diet to keep fit and if the respondent is a vegan or vegetarian.

Table 4.2 Parameter Estimates of the Double Hurdle Model-Farmers' markets

	Probit (N = 4332)		Poisson (N = 2157)	
Variables	Coefficient	SE	Coefficient	SE
Health variables				
Respondent, spouse, or child treated: cancer	0.006	0.062	0.011	0.053
Sibling, parent, or grandparent treated: cancer	-0.118***	0.042	-0.122***	0.038
Respondent, spouse, or child treated: heart disease	0.021	0.069	0.047	0.057
Sibling, parent, or grandparent treated: heart disease	0.047	0.043	-0.085**	0.039
Respondent, spouse, or child treated: diabetes	0.076	0.061	0.041	0.052
Sibling, parent, or grandparent treated: diabetes	-0.005	0.043	0.024	0.039
Respondent, spouse, or child treated: joint pain	0.023	0.044	-0.129***	0.040
Sibling, parent, or grandparent treated: joint pain	0.015	0.045	0.098**	0.040
Respondent, spouse, or child treated: Alz/dementia	0.300	0.214	-0.150	0.179
Sibling, parent, or grandparent treated: Alz/dementia	0.003	0.047	0.024	0.042
Respondent, spouse, or child treated: obesity	0.014	0.058	0.161***	0.051
Sibling, parent, or grandparent treated: obesity	0.040	0.057	-0.145***	0.052
Concerned about international food safety	0.062***	0.021	0.082***	0.020
Exercises: equivalent of 1.5-3 mile walk per day	0.259***	0.043	0.364***	0.041
Exercises: equivalent of 3+ mile walk per day	0.220***	0.067	0.314***	0.060
Family member follows diet to treat illness	0.070	0.049	-0.017	0.043
Family member follows diet to keep fit	0.105**	0.043	0.108***	0.039
Family member is vegetarian or vegan	0.326***	0.078	-0.025	0.058
Other variables				
Farmers' market within 5 miles	0.080*	0.042	0.097**	0.039
Cares about distance food travels	0.273***	0.041	0.097***	0.036
Cares about pesticide residue on food	0.146***	0.047	0.015	0.046

Table 4.2 (continued)

Cares about price of food	-0.229***	0.043	-0.136***	0.037
Number of times respondent shops for food per month	0.010***	0.004	0.032**	0.003
Number of days respondent travels per month	0.021***	0.005	0.005	0.004
Number of correct answers on agri. knowledge quiz	0.043***	0.013	0.021*	0.012
Number of meals prepared at home per week	0.005	0.005	0.006	0.004
Respondent is female	0.040	0.041	-0.014	0.037
Annual household income ($1000s)	0.000	0.000	-0.001***	0.000
Age	0.002	0.002	0.007***	0.001
Respondent has bachelor's degree	-0.038	0.039	-0.034	0.035
Number of people in respondent's household	-0.012	0.016	-0.016	0.015
Respondent is white	-0.049	0.046	-0.302***	0.040
Respondent is born in the US	0.015	0.064	0.123**	0.061
Constant	-0.971***	0.150	-0.391***	0.146
Log Likelihood	-2848.973		-3616.335	

Note: *,**, and *** denote statistical significance at the 10%,5%, and 1% levels, respectively.

Other variables

The presence of farmers' markets within five miles of respondents' zip codes is positively associated with more likelihood of buying foods and with likelihood of buying more frequently at the farmers' markets. This result indicates a need for increased number of farmers' markets to increase likelihood of buying foods from the farmers' markets. Respondents, who agreed that the miles the food travels from production location to purchase location is important, are more likely to buy at farmers' markets and are also likely to buy more frequently at those markets. Part of the reasons for this result could be that consumers are concerned about the environment; as food miles impact the environment through carbon emissions from vehicles. On the other hand, they might as well be concerned about their health; as foods with shorter travel distance are believed to retain more nutrients (Lea, 2005). Similarly those who agreed that the pesticide residue on the food is important to them are more likely to purchase at farmers' markets. This result again can be connected with both environmental as well as health concern of the consumers. Agricultural knowledge of respondents is found to be a significant predictor of local food buying behavior in both purchase decision as well as the frequency of purchase decision. Among behaviors, respondents who shop food more frequently per month and travel more in a month are more likely to purchase foods at farmers' markets. Further, the concern for food prices is found to be negatively significant. This relationship implies that consumers might think the local foods at farmers' markets are expensive than at conventional stores.

Demographic variables, consistent with Abello et al. (2014), are found to be a weak predictor of farmers' markets' purchasing decision. In our study, none of the demographic variables are found to be statistically significant on the first decision of whether to purchase foods at farmers' markets. However, the second decision of how often to purchase is found to be affected by age and country of birth. For example, those who are older and born in U.S. are likely to visit more frequently at farmers' markets. Income is found to have conflicting results among different studies. For example, Wolf, Spittler, and Ahern (2005) and Govindasamy, Italia, and Adelaja (2002) identified consumer with above-average income as local-food shopper whereas Onianwa, Wheelock, and Mojica (2005) found that income was not related to buying foods directly from farmers. In our study, we found the consumers who are in the higher income groups are likely to purchase less frequently at the farmers' markets. Similarly, those who are White are also likely to purchase less frequently at the farmers' markets.

Estimation results for farm stands (Table 4.3)

Health variables:

Table 4.3 shows the estimation results of a double-hurdle model for farm stand. In case of the first decision, most of the diseases, four out of six, significantly increase the likelihood of buying foods at the farm stands. If either the respondent, or his spouse or children have illness history of cancer, diabetes, obesity or back or joint pain in the family, he is more likely to purchase foods at the farm stand. However, none of these diseases, except obesity, seem to have any effect on respondents' first decision of buying foods when his siblings, parents or grandparents have those diseases. It indicates that respondent might be more concerned about those diseases for himself or spouse or children than for his siblings or parents or grandparents. Obesity (siblings, parents or grandparents) on the other hand, significantly increases the likelihood of purchasing foods at the farm stand.

When it comes to the second decision of how many times to purchase foods, most of the diseases are found to have negative relationship. For example, if the respondents' siblings, parents or grandparents have been treated with cancer, heart disease or diabetes, he is likely to buy less frequently at farm stands. Also, if he himself or spouse or children has been treated with obesity, he is likely to purchase foods less often at the farm stand. This effect is exactly opposite for the respondents whose siblings or parents or grandparents have obesity because he is likely to buy more frequently then. This result shows a bit strange relationship that the obesity among those family members drives them to buy local versus when they themselves get affected.

Table 4.3 Parameter Estimates of the Double Hurdle Model-Farm stands

	Probit (N =4288)		**Poisson (N =1311)**	
Variables	Coefficient	SE	Coefficient	SE
	Health variables			
Respondent, spouse, or child treated: cancer	0.169***	0.062	0.019	0.072
Sibling, parent, or grandparent treated: cancer	0.061	0.044	-0.141**	0.058
Respondent, spouse, or child treated: heart disease	0.107	0.069	-0.049	0.079
Sibling, parent, or grandparent treated: heart disease	0.029	0.045	-0.128**	0.060
Respondent, spouse, or child treated: diabetes	0.116*	0.062	0.090	0.073
Sibling, parent, or grandparent treated: diabetes	-0.011	0.046	-0.185***	0.062
Respondent, spouse, or child treated: joint pain	0.100**	0.045	-0.053	0.059
Sibling, parent, or grandparent treated: joint pain	-0.054	0.047	0.135**	0.061
Respondent, spouse, or child treated: Alz/dementia	-0.015	0.210	-0.058	0.244
Sibling, parent, or grandparent treated: Alz/dementia	-0.019	0.049	0.061	0.064
Respondent, spouse, or child treated: obesity	0.112*	0.060	-0.153*	0.078
Sibling, parent, or grandparent treated: obesity	0.154***	0.059	0.175**	0.074
Concerned about international food safety	0.033	0.022	0.002	0.031
Exercises: equivalent of 1.5-3 mile walk per day	0.061	0.045	0.171***	0.060
Exercises: equivalent of 3+ mile walk per day	0.074	0.071	0.142	0.098
Family member follows diet to treat illness	0.049	0.051	0.048	0.068
Family member follows diet to keep fit	0.038	0.045	-0.055	0.059
Family member is vegetarian or vegan	0.106	0.080	-0.129	0.110
	Other variables			
Farmers' market within 5 miles	-0.004	0.109	0.074	0.148
Cares about distance food travels	0.287***	0.043	0.070	0.056
Cares about pesticide residue on food	-0.069	0.050	0.157**	0.069

Table 4.3 (Continued)

Cares about price of food	-0.168***	0.045	-0.140**	0.057
Number of times respondent shops for food per month	0.013***	0.004	0.024***	0.004
Number of days respondent travels per month	0.022***	0.005	0.005	0.006
Number of correct answers on agri. knowledge quiz	0.035***	0.014	0.041**	0.018
Number of meals prepared at home per week	0.000	0.005	-0.006	0.007
Respondent is female	0.040	0.043	-0.052	0.058
Annual household income ($1000s)	0.000	0.000	-0.001**	0.000
Age	0.006***	0.002	0.014***	0.002
Respondent has bachelor's degree	-0.040	0.041	0.013	0.055
Number of people in respondent's household	0.058***	0.017	0.023	0.025
Respondent is white	0.070	0.049	-0.055	0.068
Respondent is born in the US	0.254***	0.072	0.539***	0.143
Constant	-1.849***	0.192	-1.088***	0.292
Log Likelihood	-2498.403		-1836.324	

Note: *,**, and *** denote statistical significance at the 10%,5%, and 1% levels, respectively.

Apart from these diseases, one more health variable is found significant in the second decision; i.e. physical activity level. Meaning, respondents who consider themselves as active (i.e. walks 1.5 miles to 3 miles a day) are likely to purchase more frequently at farm stand as compared to those who consider themselves as less active (i.e. walks less than 1.5 miles a day).

Other variables:

Respondents who agreed that the miles the food travels from production location to purchase location is important are more likely to buy at farm stand. Similarly those, who agreed that the pesticide residue on the food is important to them, are likely to purchase more often at the farm stand. Agricultural knowledge of respondents is found to be a significant predictor of local food buying behavior in both decisions. Respondents who shop food more frequently per month and travel more in a month are more likely to purchase foods at farm stand. A negative relationship is found for the price of food which implies that consumers might think that the local foods at farm stands are expensive than at conventional stores.

Among demographic variables, those who are in older age group are more likely to visit farm stands and likely to visit such stands more frequently which is in contrast to the finding of Zepeda and Li, 2006 who found that age is not significant for local food purchase. Similarly, those who are born in U.S. are found to increase likelihood of both decisions. Also, those with higher number of household are more likely to buy foods at farm stands. Finally, those in the higher income group are likely to purchase less frequently at farm stands which is consistent with the result of the farmers' markets of our study.

Comparison of the estimation results between two markets

We found that the respondent is more likely to buy at the farm stand if he or spouse or children have suffered from cancer, diabetes, obesity or back or joint pain but these diseases are not found significant enough to drive them to the farmers' markets. One possible explanation for these different results within two markets might have to do with the fundamental differences between these two local outlets in terms of ways they operate. Generally, farmers' market is operated in a common area where several farmers gather to sell their produce whereas farm stand usually has a single vendor with roadside tables. So, health concerned consumers with a clear intention of buying local foods might visit farm stands but those who visit farmers' markets might be motivated with activities like music, social interactions, free sampling foods or just walking around the downtown. Obesity also seems to have contrasting effects between the two markets. Respondents' second decision of how many purchases is found to be affected oppositely among two markets depending on which member of the family has been treated with obesity. For example, if respondent or spouse or children has obesity then he is likely to purchase more frequently at farmers' markets but less frequently at farm stand. On the contrary, if his siblings or parents or grandparents have obesity then he is likely to buy less frequently at farmers' markets but more frequently at farm stand. It is hard to explain why consumers prefer farmers' markets when their spouse or children or themselves have suffered from obesity but prefer farm stand when their siblings or parents or grandparents have obesity. There are two diseases (cancer and heart disease) whose results are found to comply with both markets; i.e. if respondent's siblings or parents or grandparents have illness history of cancer or heart disease, he is likely to visit less frequently to farmers' markets as well as to the farm stands, which is a surprising result. Overall, in both markets, most of the diseases are found to have positive effect in first decision but negative effect in the second decision. The positive association of the diseases with local food purchase in the first decision might be because of the perceived lower health risk of local foods. Even though people with family illness history are more likely to visit local markets, the negative relationship in the second decision shows that they don't seem to visit as frequently. In fact, their purchase frequency decreases when they have more diseases in the family. One of the reasons to explain such behavior may have to do with the fact that people connect health to diet as a part among many other ways (medication, fitness, counseling, etc.) to deal with the diseases. So, when they encounter more diseases in the family, they might need more time and money for other activities like exercise, doctor appointments, etc. which leave them chance to go to the local markets less frequently.

CHAPTER V

SUMMARY AND CONCLUSIONS

There are an increasing number of consumers motivated by health concerns to buy local foods (Maples et al., 2013; Onozaka, Nurse, and McFadden, 2010; Zepeda and Li, 2006; Wolf, Spittler, and Ahern, 2005). Our study defines local foods as foods that are bought directly from farmers at farmers' markets and farm stands. This is fairly consistent with how it is defined in several studies (Hand and Martinez, 2010; Martinez et al., 2010) that focus on the set of marketing channels that are utilized by farmers[2]. Given this definition, the overall objective of this study is to determine the significant factors that motivate consumers to buy local foods in the southeastern United States, and to find out whether health motivation is an important factor for such purchases.

Existing literature have incorporated variables that attempt to examine the effect of health concerns on consumer local food purchases. For example Maples et al. (2013) found that family illness incidences are a significant factor for purchasing foods directly from producers. Similarly, Zepeda and Li (2006) noted that consumers often give health and nutrition as reasons for buying local foods. Govindasamy, Italia, and Liptak (1997)

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[2] Some literatures also include intermediated food sales (direct-to-grocer/restaurant) as part of such channels. However, we do not include this in our study.

pointed out that consumers ranked health value, and absence of pesticides as most important product attributes for local food, among other attributes.

Findings from existing studies indicate that health motivation can be a significant driver of local foods purchase. However, health motivation is a broad term which does not explain what specific health aspects determine consumer purchase decisions. Although existing studies have shown that health motivation is a significant driver of local foods purchase, it has not been explicitly explored the specific diseases and their effects on local food buying behavior. Our study fills this gap in the literature by assessing health motivation via six specific diseases (cancer, heart disease, diabetes, obesity, back or joint pain and Alzheimer's or dementia) and studying in depth how each disease affects the choice of purchasing local foods.

We used online consumer survey data to examine the characteristics of consumers who buy foods from the local food outlets such as farmers' markets and farm stands in the southeastern United States. The main question that we asked in the survey was whether and how frequently, in the past month (our survey was conducted from August 9-26, 2013), southeastern consumers bought foods directly from farmers at farmers' markets or farm stands. Our study question is different from the existing literature as respondents were asked to report direct purchases from growers within the past month. Respondents were also asked to indicate whether or not they themselves, or specific family members, had received treatment for the six diseases, as opposed to indicating a health concern or perceived likelihood of contracting the illness in the future- this variable captured self-reported specific disease diagnosis and treatment. These questions were asked because we were particularly interested in finding out whether a relationship exists between disease incidences and consumer decisions to buy food directly from a grower. We hypothesized that disease incidences in the family should increase respondents' likelihood of purchasing foods at farmers' markets and farm stands, and should also increase their frequency of purchase at those markets.

Different results are found for two markets. In case of the farm stands, most of the diseases (cancer, diabetes, obesity and back or joint pain) show a positive and significant effect of illness incidences on the likelihood of food purchases. On the other hand, in case of the farmers' markets, this likelihood, although positive, is not statistically significant. Apart from diseases, most of the other health variables (food safety concern, physical activity level, concerns for food miles and pesticide residue and special diet) are found to be statistically significant for both markets indicating increased likelihood of local food purchase as well as likelihood of increased frequency of purchase. This gives us an understanding that health concerned consumers in the southeast are more likely to buy directly from local sources to improve health benefits that are perceived to be associated with eating such foods. This finding may be very important for future research which can investigate the health benefits of local foods. If food scientists are able to test whether local foods are in fact healthier, whatever the finding will be, it may help health conscious consumers to understand clearly whether or not their efforts of buying foods directly from the producers could have direct effects on their personal health.

Implications of the study

The findings of this study could have important implications for local food producers and product marketers in the southeastern United States. Southeastern consumers seem to have positive attitudes towards local foods who believe that consuming local foods might contribute to improve their personal health. For example, consumers, who have diseases like cancer, diabetes, obesity and back or joint pain in the family, are more likely to buy foods at farm stands. Similarly, those who exercise more and are concerned about food safety, about pesticide residue and about food miles are found to have positive effect in local food purchasing decision. Product marketers can take this information and emphasize these specific factors in the marketing strategy that could draw attention of all the health concerned consumers in the southeastern region. For example, since cancer is found statistically significant, marketers can highlight the health benefit of local foods that can fight cancer. One example of such foods could be fresh tomatoes whose antioxidants help to fight cancer (U.S. Department of Agriculture [USDA], Center for Nutrition Policy and Promotion, 2015). If this marketing effort is done effectively, especially during October which is a cancer awareness month, then producers may be able to use such information in their marketing efforts, targeting consumers who may be specifically concerned with health issues related to cancer. We do not argue that foods bought directly from producers at farmers' markets and farm stands are any healthier than those bought from other outlets, but rather see this as an opportunity for producers to cater to specific consumer concerns, if they so choose. To support such marketing channels (e.g. direct purchases from farmers at farmers' markets and farm stands), government can play a vital role by increasing more agricultural branding programs that promote direct-to-consumer sales within the state in the southeastern region.

On the other hand, producers can also utilize the findings of this study while growing their foods. One way to utilize the findings is to change production practices in a way to incorporate consumer values. For example, since food miles and pesticide residue are ranked as important factors for purchasing foods from framers' markets and farm stands, farmers may want to sell their foods in a shorter distance and use less pesticide residue as possible while growing their foods. Of course, this practice might limit their reach to distant selling venues; however they might perhaps be able to get more local consumers if they are able to market their products effectively emphasizing what they did to grow their foods to take into account the health concerns of their consumers.

Weakness of the study

During the data analysis, we noticed some of the data limitations which if fixed could have resulted in better interpretations of the findings of this study. One of the issues is a possible correlation among some of the six diseases such as obesity, heart-disease, diabetes and back or joint pain. Existing literatures show that obesity is closely linked with other diseases such as heart disease and diabetes (U.S. Department of Health and Human Services, & National Heart Lung and Blood Institute, 2010; Van Gaal, Mertens, and Christophe, 2006) and also with low back pain (Shiri et al., 2010). In our study, we assume none of the diseases are correlated with each other. To be confident about our assumption, we checked the correlation between each of the six diseases and every other disease and found that the coefficients are small, generally less than 0.25 for all the diseases. This suggests that the correlation between diseases might not be significant. Although the correlation coefficients were found to be small for all the diseases, the highest correlations, however, were found between heart disease and diabetes, obesity and diabetes and obesity and back or joint pain. Therefore, we tried to address these correlations between heart disease, diabetes, obesity and back or joint pain in our models by using several different coding (e.g. dropping diabetes, dropping obesity, combining heart disease, diabetes, and obesity, etc.) but nothing appeared to make any great impact. Results might have changed very slightly, but no intuitive models results were found. Hence, we proceeded with our assumption of no-correlation between the diseases.

Another issue is the suspicion of endogeneity in our model. We hypothesized that the disease incidences affect whether a respondent buys foods at farmers' markets or farm stands, but the pattern could be reverse, i.e. buying at those markets could affect the diseases incidences (reverse casualty). In order to control for this reverse casual effect, we needed to have instrumental variables that affect disease incidences but not whether a respondent goes to farmers' markets or farm stands. A first thought was that the respondent's parents and siblings could be used as instrumental variables because the respondent, who is a primary food shopper of his family, is assumed not to be responsible for feeding his parents and siblings (for treatment of diseases) who are assumed not to be the part of his household. However, if the parents and siblings had diseases, the respondent might shop at farmers' markets or farm stands for prevention of the diseases in his family (spouse and children). Because of this prevention problem, it was hard to think of any other instrumental variables. Therefore, in our study, we included those instrumental variables just to address the treatment concern which should apply only to the household. However, further research could focus on a more formal test of this issue.

Furthermore, another issue is the difficulty to know who actually lives in the respondent's household. Since, in our survey, we did not explicitly ask the respondent to indicate who is living in his household, we don't have enough information about the makeup of the household. If we had this information, it would be easier to interpret the results in terms of treatment versus prevention of the diseases. For example, in our estimation results for farmers' markets (Table 4.2), we found that if the respondent or his spouse or children have been treated for obesity, he is likely to buy foods at farmers' markets more frequently but if his siblings, parents or grandparents have been treated for obesity, he is likely to buy less frequently at those markets. Given our assumption is true (i.e. respondent's household consists of himself, his spouse and his children); this result would imply that the consumers buy foods at farmers' markets for treatment of the obesity rather than for the prevention but because of the lack of knowledge regarding household members, this interpretation cannot be set forth with confidence.

In addition to the above mentioned issues, we also detected a problem regarding the way some questions were asked in the survey and realized that the questions could have been asked in a different way to get more clear answers specific to local foods purchase. For example, respondents were asked whether they buy any foods at farmers' markets or farm stands but this question could have been asked differently so that we can know what specific products (fruits, vegetables, meats or other products) they buy at those outlets.

Future research

Our study found that the health concerned consumers in the southeast USA are more likely to buy directly from local sources (farmers' markets and farm stands) to improve health benefits that are perceived to be associated with eating such foods even though science is inconclusive about this perception (Martinez et al., 2010; Vogt and Kaiser, 2008). This therefore seems to suggest that caution must be exercised in drafting marketing strategies that may exclusively purport health benefits of these foods over those bought from other outlets.

In addition, in the future research, all the issues mentioned in the weakness of this study could be revisited and addressed to the extent that could solve those issues appropriately. For example, some questions could be added in the survey to get clear answers to the questions such as: who are the members of the respondent's household, what specific products they buy at local food outlets, and whether they make direct purchases for treatment or for prevention of the diseases. Such further investigation could add more meaning to the findings of the study that focus on the specific health factors for local food purchasing decisions.

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