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Willingness to pay for local food?: Consumer preferences and shopping behavior at Otago Farmers Market

Nathan Berg [1,*], Kate L. Preston

University of Otago, PO Box 56, Dunedin 9054, New Zealand

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ABSTRACT

New Zealand (NZ) survey data from Otago Farmers Market (OFM) provide new expenditures-based measures of local food preference. Discounts applied by consumers to non-local food items (e.g., from USA, China, or elsewhere in NZ) are reported. Some consumers have lexicographic preferences; they are unwilling to purchase non-local food at any price. Others are willing to substitute non-local for local food when priced appropriately. Tobit and Fractional Probit models describe how consumer characteristics affect willingness to pay (WTP) for local food. The mean consumer's premium in WTP when a produce item is "local" ranges from 2.1 to 8.0% and is positively associated with age and income.

1. Introduction

Otago Farmers Market (OFM) consists of 50–60 vendors selling a variety of vegetables, fruits, meat and prepared food that open for business most Saturday mornings throughout the year from 8 am to noon. Vendors are required to be the producer of their own products and to be from the surrounding region (Otago Farmers Market, 2015). OFM is therefore an important location in the Dunedin economy where consumers can buy local food directly from the producer. Although various theoretical rationales have been put forward to motivate expansion and development of new local food economies, the extant empirical literature provides, as yet, relatively scant descriptive characterization of consumer behavior when purchasing

* Corresponding author.
E-mail addresses: Nathan.Berg@otago.ac.nz (N. Berg), preka531@student.otago.ac.nz (K.L. Preston).
[1] University of Otago, Department of Economics, PO Box 56, Dunedin 9054, New Zealand, and University of Newcastle (Australia). Funding from the Australian Research Council (ARC) is gratefully acknowledged, Award Number DP150100242.

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local food from the standpoint of microeconomic theory.[2] Our empirical analysis is intended to address the question of which observable factors about consumers—explanatory variables grouped as *demographics and proximity*, *shopping behaviors*, and *attitudes* (i.e., self-reported motivations for shopping for local food)—are relatively important in influencing expenditures, shopping frequencies, and willingness-to-pay (WTP) premiums for local food.

We therefore designed a survey to elicit information about consumer preferences for local food concerning mechanisms that could be potentially useful both for private organizations and public policy makers undertaking market design—complementary with transportation networks—along with sellers in this market and other groups seeking to expand local food economies. Data collection followed the goals of: (i) generating a novel description of how consumer preferences drive observed purchasing behavior (measured as *levels* of expenditure on local food; the *proportion* of local food expenditures in total food expenditures; and shopping *frequency*), and (ii) comparing techniques for measuring consumers' subjective valuations of *localness*, reported both as empirical distributions and conditional models (e.g., regression) of the mean consumer's WTP premium for local food. An important observation in our data, however, is that there are two distinct subpopulations, one of which feels so strongly about the value of localness that they are not interested in purchasing non-local food even if its price is zero (i.e., lexicographic or non-compensatory preferences for local food). This observation requires special techniques of estimation that use different functional forms to describe expected purchasing behavior across these two subpopulations rather than averaging across the two.

Consumer advocates and policy makers in many parts of the world are pursuing policies that favor local food production based on motives such as environmental quality, public health, and local economic development (through expansion or intensification of the local food economy). Given such developments on the supply side (i.e., farmers markets being promoted by cities, regional governments and private entrepreneurs), one might suppose that there is already a substantial literature reporting broad empirical evidence which shows how observable characteristics of consumers and local food markets jointly affect (or predict) consumer preferences for local food. The empirical literature describing how geographic proximity of consumers to the place of origin of food products that they purchase is, however, limited. We seek to fill this lacuna by providing new observational evidence about: the intensity of local food preferences; the prevalence of different motives underlying consumer preferences for local food; the observable institutional characteristics of different local food markets that amplify or attenuate local food consumption; and the price-sensitivity of individual decisions to purchase local food and to other measurable features of farmers markets such as convenience and quality. The primary motivation for, and contributions of, this paper are descriptive.

The number of farmers markets in New Zealand (NZ) increased from one to more than 30 from 1997 to 2007 (Cameron, 2007). Beyond standard consumer motives such as quality, price, and convenience (Guthrie et al., 2006; Lawson et al., 2008), a distinct set of social and environmental motives also appear to be important to a substantial share of consumers interested in shopping at farmers markets.[3] Social motives for shopping at a farmers market can be surprisingly subtle and difficult to measure, however. For example, the sentiment of "supporting local business" is, in political or ideological terms, highly non-specific. It would be unsurprising, for example, to hear such sentiments expressing support for local businesses from Green Party supporters that campaigning for environmental sustainability as well as from National voters and Chamber of Commerce boosters. Theoretical motivation for our empirical inquiry could be cast in terms of a random utility model of a representative consumer's decision about how much to spend on local food. Another (complementary) theoretical motivation could be cast as seeking to better illuminate how to rank policy objectives which aim to increase local food consumption based on a social welfare function prescribing, for example, reductions in food miles, improving environmental quality, and various public health motives thought to improve social efficiency.[4]

Previous studies reveal that "local" is an important hedonic attribute of food not subsumed by freshness or other confounding quality characteristics (Darby et al., 2007). We therefore collect and report additional information about willingness-to-pay premiums for local food and subjective discounts applied to foreign items. The goal of measuring consumers' valuations of "local" as a hedonic attribute of food complements previous work demonstrating wide-ranging relevance to both public health campaigns and firms' efforts to market healthy food (e.g., Harker et al., 2010; Bublitz et al., 2013; Bublitz and Peracchio, 2015). We follow Luomala (2007) in distinguishing food attitudes from actual food purchases. Based on a food marketing experiment, Choi and Reid's (2016) data reveal important distinctions between health consciousness as a consumer characteristic (positively affecting purchase behavior) and perceived healthiness of advertised food (which has weaker effects). The willingness-to-pay premium variable that we analyze can be interpreted as the net effect of an underlying "muddling-through decision process" based on conflicting goals (Hausman, 2012) or as the result of orthodox benefit-cost maximization. The lexicographic preferences among the subset of consumers with exactly zero willingness to pay for

[2] A number of important papers examining other interesting aspects of farmers markets are discussed subsequently.

[3] The "farmers market" as a retail format has been around for many decades and covers a heterogeneous assortment of markets sizes, proportions of genuinely local products, and degrees of public support in ownership structure. The quantitative measures of willingness to pay for *localness* as a food attribute are not intended to generalize in any straightforward way to a well-defined population of farmers markets with identically distributed error terms.

[4] Establishing an exhaustive list of stakeholders in the local food economy is complex. The most directly linked stakeholders that we focus on are OFM shoppers and vendors. Social objectives such as public health, environmental sustainability, and local economic development would, of course, imply different views of the social welfare function. There is, at least in theory, a possible indeterminacy regarding the effect of local food on social welfare. Policies that encourage local food could, at least in theory, reflect socially inefficient rent seeking by politically connected producers (or consumers). Such motives seem unlikely, however, insofar as it is primarily very small producers engaged in small-scale production and consumers who prefer small-scale production that we find at OFM. They are small in number and have very small budgets (if any at all) for political lobbying.

non-local food as revealed in our data, however, cast doubt on utility maximization of any commensurable objective function that permits trade-offs between non-local versus local at a consistent and finite internal rate of exchange (cf., Luan et al., 2011; Berg, 2014; Artinger et al., 2015; Woike et al., 2017).

Ragland and Tropp (2009) characterize the kinds of people and sources of utility derived from shoppers at eight farmers markets in a New England state. A number of qualitative case studies of a particular farmers market reveal place-specific institutional detail from which those seeking to expand farmers markets and local food economies can learn a lot. Another farmers market sub-literature focuses on what kinds of sellers tend to be present at farmers markets (e.g., Hunt, 2007). Yet another stream in the farmers market literature focuses on demographics of people who do and do not have access to farmers markets, focusing on low-income and ethnic minority subpopulations (e.g., Larsen and Gilliland, 2009). Cameron (2007) studies farmers markets as small business incubators. And economic impact studies of farmers markets provide context from the standpoint of local economic development (e.g., Hughes et al., 2008). The social meanings and notions of identity produced by the experience of shopping at farmers markets is another interesting sub-literature (e.g., Smithers et al., 2008). Zepeda (2009) and Byker et al. (2012) survey the research on farmers markets, providing a useful overview of what has been studied (Zepeda, 2009). A survey of five Scottish farmers markets based on survey data similar to ours nicely describes preference drivers of shoppers although without the techniques of willingness-to-pay for localness and information on geographic proximity that are our focus (Lyon et al., 2009). Trobe (2001) reports survey-based data from a farmers market (similar to the attitudes measures we use); he cites reductions in food-miles as an environmental benefit but without addressing distances that shoppers must travel to have access to local food. Of special relevance in motivating our work on preferences for localness is the survey by Brown and Miller (2008), which report that distance from the shopper's home (or having been produced in the shopper's home region) is how many consumers define localness and that WTP may be as much as twice as much for local food.

Farmers markets are, in some cases, vital outlets for small agricultural producers squeezed out of the grocery market (Cameron, 2005, 2007). Mainstream grocery stores also sometimes carry some local food. Thus, stakeholders in the food system would include major grocery stores, food producers (large and small), and consumers with heterogeneous preferences, nutritional requirements and uses of food in their lives. In addition to farmers markets being of interest in their own right, new empirical information about consumer purchases of local foods is perhaps just as relevant to major grocery stores, conventional food producers, food and business regulators, and complementary industries such as tourism (e.g., Low et al., 2015; Fathelrahman et al., 2015; United States Department of Agriculture, 2015; Wu, 2015). Institutional characteristics of the market such as opening hours, parking, product availability and pricing have obvious relevance for consumers and to proposals for expanding local food availability (Ministry for Primary Industries, 2015).

The remainder of this paper is arranged as follows. Section 2 describes the data used in the empirical analysis and descriptive statistics. Results are reported in Section 3. Section 4 concludes.

2. Data and hypotheses

In March 2015, 114 OFM customers were interviewed onsite by 11 paid interviewers who were trained to follow a written script for random approach from set physical locations covering the entire physical area of OFM.[5] In addition, postcards were given out to OFM shoppers asking for online survey respondents (also advertised in OFM's March 2015 newsletter), resulting in a further 23 online survey participants. The dataset is cross-sectional and each observation corresponds to a unique respondent from a unique household. Comparing the 11 interviewers' reported numbers of "approaches" versus completed surveys, we estimate that the response rate was one in three. Interviewers stood onsite continuously during hours of OFM operation. They were assigned to stand in locations so as to approximate uniform spatial coverage of the market. Unfortunately, there is no census of all shoppers against which to cross-validate our results. The empirical results that follow can be interpreted within a common conceptual framework of a random utility model in which the consumer's objective function depends on attributes of food items, institutional characteristics of food markets, and individual demographic characteristics described below. The dependent variables are proxies for willingness to pay in units of currency. The percentage change in willingness to pay for local versus non-local food items provides a relative measure in percentage points on a 0–1 scale where 1 represents a 100% difference. Frequency of shopping is measured as an indicator for being a weekly shopper, a proxy for expenditure of effort to have access to the farmers market. In a random utility model, the explanatory variables can shift the conditional expectation of utility up or down.

2.1. Dependent variables

We elicit each respondent's OFM expenditure on the particular day of the survey, labelled as the variable *Spend* (in NZ$). Using self-reported shopping frequency (based on a survey item about the number of annual visits to OFM), we impute each consumer's annual spend (*AnnualSpend*). The first set of empirical models focus on the variable *LnAnnualSpend*, which is the natural logarithm of imputed annual spend so that estimated effect sizes represent percentage changes in spend associated with a one-unit change in the independent variable. Finally, we consider the variable *PropAnnualSpend* measuring

[5] Appendix S (Survey) contains the survey script our interviewers used.

AnnualSpend as a proportion of the respondent's self-reported total annual food expenditure. An indicator variable for shoppers whose frequency of shopping is weekly is also analyzed in a suite of probability models. It turns out that weekly shoppers are responsible for an estimated 91.7% of imputed annual OFM revenue.

A second set of dependent variables measures percentage decreases in WTP for non-local versus local NZ produce (i.e., strictly positive percentage decreases indicate subjective discounting). To avoid dividing by zero for consumers with such a strong local preference that *Non-Local WTP* = 0, we scale the discount positively so that it can be interpreted as a local food premium: 1 - (*Non-Local WTP*)/(*Local WTP*). When WTP is identical for non-local and local food, then the local food premium is zero. The premium can also be negative if the consumer has greater WTP for the non-local item. When *Non-Local WTP* = 0, the consumer is discounting non-local food 100% and, by the definition of premium (as a positive percentage discount), we can interpret this discount as a local food premium. The three discounts (scaled positively to be interpreted as subjective local food premiums) we report and model are: willingness to pay for NZ over US produce (*US-NZ Discount*); NZ over Chinese produce (*China-NZ Discount*)[6]; and Otago (the local region) over non-local produce grown elsewhere in NZ (*NZ-Otago Discount*).

The variable *WTPNZ* measures responses to a survey item that elicited WTP for NZ-grown produce in slightly more general terms. Respondents were first asked if they ever buy lemons. If they responded "yes," then they were asked the maximum they would pay per kilogram for lemons from NZ. If they did not buy lemons, the survey proceeded to ask if they would buy oranges; if not oranges, then garlic; and if not garlic, then tomatoes, stopping whenever the first food item that the respondent regularly purchases had been identified. We collect values for different products in a single variable and then transform to a percentage change so that each consumer's subjective discount is comparing the same food item from two source locations. Fig. 1 shows the empirical distribution of *WTPNZ* and its log transformation, *LnWTPNZ*, which we use in empirical models because it is significantly less skewed. Only 69 observations were valid due to difficulty experienced by interviewers in asking and by customers in answering questions on WTP, as well as the presence of some customers in the sample who never buy any of the above food items. In contrast to WTP for produce from the U.S. and China where a majority of respondents has zero WTP, all observations of *WTPNZ* are strictly positive.

Respondents were asked their WTP for the same product if that product instead (of being from NZ) had come from China, the U.S., or Otago (with otherwise equal observable quality attributes). This hypothetical scenario may be difficult to realistically envisage (e.g., foreign and local food items with equal freshness). We argue, however, that for the items in our interview script (lemons, oranges, tomatoes or garlic), it is hardly incredible to imagine that the global food supply chain regularly delivers these items to consumers, side-by-side in the store with no perceptible differences in freshness. We use this information to estimate each individual's implied valuation for more "local" production across various comparisons of production location. The variables *China-NZ Discount* and *US-NZ Discount* measure subjective premiums (as defined above) that the consumer is willing to pay for otherwise identical produce from NZ rather than one of those two counterfactual source countries. The variable *NZ-Otago Discount* measures the subjective premium in WTP for local Otago versus NZ produce from outside the Otago region. No one discounted non-local Ex-Otago NZ produce by 100%.

There is a relatively high frequency (although less than a majority) of consumers who report being indifferent in terms of WTP for a produce with identical hedonic attributes except for source country or region. Those individuals with indifferent preferences have a discount equal to exactly zero. At the other extreme are consumers who have a strictly positive valuation for the local product and exactly zero willingness to pay for the non-local product: 39 out of 68 who responded gave WTP for the Chinese product as exactly zero (coded as 100% discounting); similarly, 33 out of 63 who responded gave WTP for the US product as exactly zero. WTP for *Otago* and *Ex-Otago NZ* are strictly positive in all cases.

If there were not so many zero values of WTP for the non-local product, then it would have perhaps been more intuitive to define the dependent variables as local-food premiums over WTP for non-local food. But this percentage increase is infinite or undefined for people with zero WTP for non-local food. Therefore, we define the local-food premium as the absolute value of the non-local-food discount. WTP for local food is strictly positive for all survey respondents. Therefore, the percentage discount moving from WTP for local to non-local is always defined. Higher discounts represent more intense preference for local food, justifying their interpretation as local-food "premium."

The distributions of *China-NZ Discount* and *US-NZ Discount* both exhibit a modal cluster of observations at the upper tail comprised of individuals who apply a 100% discount to foreign-grown produce (i.e., zero WTP for "otherwise identical" products grown in China or the U.S.). In contrast, discounts applied to Ex-Otago-relative to Otago-grown produce had no observations of a 100% discount rate and had a large (modal) cluster of zero discounts.

Table 1 presents basic summary statistics for respondents' subjective discounts in levels (units of NZ$/kg) applied to non-local food. In all cases, the mean discount is negative and significantly different from zero at the one percent level. The first rows of Table 1 show that the mean respondent is willing to pay more than $4.68 *more* for a kilo of NZ lemons (or oranges, tomatoes or garlic) than the same items grown in China and $4.36 more for those grown in the U.S. The local discount for Otago versus Ex-Otago NZ is considerably smaller at $0.53 per kilo, which sill achieves economic significance at moderate sales volumes. To avoid the confounding factor of variability in consumers' levels of WTP, we normalize the three dependent

[6] Why is China used as a point of comparison? In terms of food miles from Dunedin, New Zealand, distances to the US and China's largest ports (Los Angeles and Shanghai, respectively, by volume) are quite similar, both in physical distance and travel time (9886 km from Dunedin to Shanghai; and 11,391 km from Dunedin to Los Angeles). By comparing China and the U.S., we can interpret differences in WTP as an expressed concern for food safety and agricultural practices in these two places that goes beyond food miles *per se*.

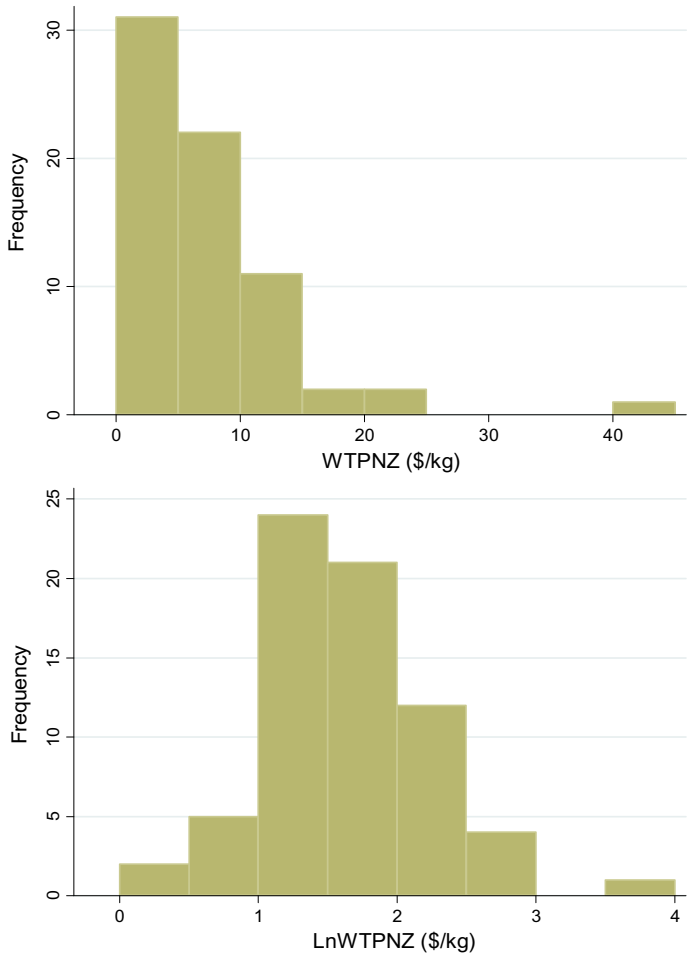

Fig. 1. Empirical distributions of WTPNZ and LnWTPNZ.

Table 1
Within-person differences in Willingness to Pay (WTP) for China v. NZ; USA v. NZ; and Ex-Otago NZ v. Otago.

Difference in WTP per kg	Mean ΔNZ$/kg	Std. error	Obs.	p-value
China-NZ Difference	−4.68	0.78	62	0.0000
US-NZ Difference	−4.36	0.83	59	0.0000
(Ex-Otago NZ) *NZ-Otago Difference*	−0.53	0.20	64	0.0086

The p-value in each row corresponds to the null hypothesis that the non-local versus local difference in the column labelled "Difference in WTP per kg" has mean equal to zero.

variables in Table 1, which measure subjective discounts (applied to non-local food items) as differences in dollars, by WTP for NZ, to construct percentage-change discounts that we use below as the dependent variable in subsequent empirical models.

Before normalizing, Fig. 2 shows the bivariate empirical distribution of WTP in units of $/kg as scatterplots for the three pairs of source locations for which WTP was elicited. The first two scatterplots in Fig. 2 show the cluster along the y-axis of individuals (zero WTP for the non-local good). These respondents have maximally intense preference for local food that can be interpreted as having effectively lexicographic preferences by which *WTPChina* or *WTPUSA* is zero (implying an infinite rate of discount for non-NZ produce). Economists' standard specifications of preference typically rule out such incommensurability. Our data provide evidence of a distinct segment of OFM consumers with incommensurable preferences in favor of domestic food. In contrast to the segment of the sample along the y-axis with zero WTP for foreign food, the subsample with positive WTP for foreign food is scattered around a finite-sloped bivariate regression line (with slope greater than 1 expressing higher WTP for NZ food but with a well-defined rate of commensurability when more attractively priced foreign produce

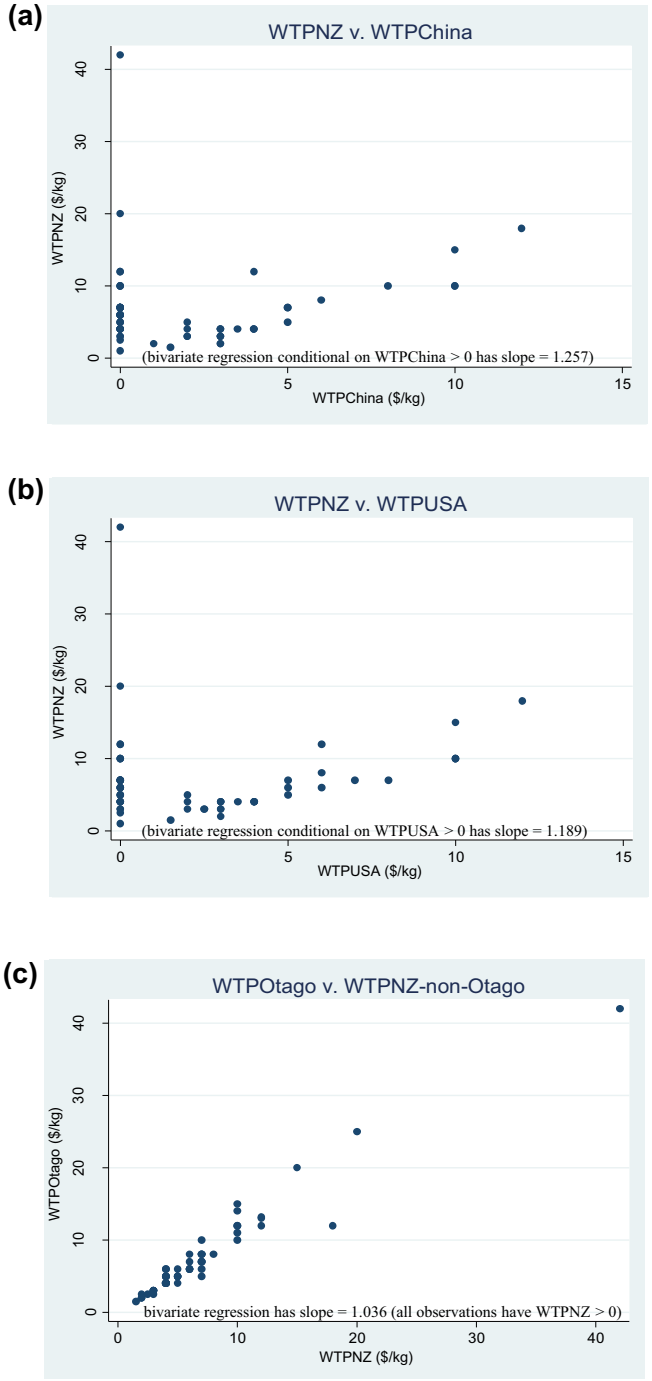

Fig. 2. Bivariate distributions of WTP for non-local (China, USA and Ex-Otago-NZ) and WTP for local place of origin in an otherwise identical food item (Lemons, Tomatoes or Garlic).

dominates higher-priced local food). Both groups of consumers are typically willing to pay a premium for NZ products but with sharply contrasting willingnesses to trade off preferred places of origin for lower prices.

The final scatterplot in Fig. 2 does not show any lexicographic clustering along the y-axis, as all respondents have strictly positive WTP for Ex-Otago produce grown in NZ. The bivariate regression line has a slope of 1.036, which implies that consumers in our sample were willing to pay, on average, a 3.6% premium for Otago-region food. The mean resopondent's Otago premium is around 8%. Unconditional elasticity of *WTPOtago* with respect to Ex-Otago *WTPNZ* can be computed as the slope

of a bivariate regression of Ln(*WTPOtago*) on Ln(*WTPNZ*), which is 0.021. For every unit of value a consumer derives from a non-local NZ food item, an extra 2.1% is derived from otherwise identical items produced locally (i.e., in the Otago region). A handful of respondents preferring non-Otago over Otago items (i.e., negative local premiums) are visible in the last scatterplot in Fig. 2 as those observations that fall below the 45-degree line.

2.2. Explanatory variables

Table 2 lists all explanatory variables used in the empirical models with encompassing specifications grouping variables as *Demographics*, *Behaviors* and *Attitudes*. The household income variable *LnHhIncome* is imputed from a categorical survey item whose empirical distribution appears in Appendix 1. Because its empirical distribution is highly skewed, a natural-log transformation was applied. Midpoint values of each discrete income bracket are used except for the highest income bracket ($150,000+) for which $150,000 was imputed before logging to compute *LnHhIncome*.[7] All other *Demographic* characteristics are coded as categorical variables.

In Table 2, *Behaviors* variables include indicators for whether a respondent shopped at OFM primarily for organic or free-range foods (Bauer et al., 2013); if the respondent bought prepared food or drinks to be consumed onsite at the market; or if the respondent purchased local food from sources other than OFM. These measures could have been measured using a Likert scale or some other non-binary scale with more sample variation; interpreting the units of measure for the right-hand-side variables then becomes a problem. Applied researchers frequently wind up dichotomizing (e.g., using a median split) to deal with this important issue of interpretable units of measure.

The next group of binary indicators labelled *Attitudes* were elicited as follows. Respondents were asked to name their top three reasons for shopping at OFM and the single top barrier preventing them from spending more at OFM. Some respondents listed more than three reasons for shopping at OFM or more than one major barrier preventing them from spending more. The variable *Service* incorporated responses showing preferences for face-to-face contact with producers based on phrases and words such as 'friendly' service of vendors, the possibility to 'interact' with them, or to 'get to know' them. The variable *SupportLocal* captured an expressed motive of wanting to support local farmers or businesses. Empirical effects of localness in the context of local versus global brands are reported in Halkias et al. (2016), Zhou et al. (2015), Liu et al. (2013), Kumar et al. (2009); and Ralston (2003). Vendors at farmers markets were studied by Murphy (2011) and Onianwa et al. (2005). A companion study of ours employs mixed methods with interview and survey data collected from vendors.

Log transformations of *WTPChina* and *WTPUSA* (each separately) are included as independent variables in regressions of *LnWTPNZ*. *WTPChina_Positive* and *WTPUSA_Positive* are indicators recording whether *WTPChina* and *WTPNZ* are strictly positive or zero. Indicators for positive WTP for foreign food are interacted with other right-hand-side variables in empirical models of *LnWTPNZ* to allow other conditioning variables to affect *WTPNZ* with different slopes. Joint statistical significance of the ten interviewer fixed effects is tested. *Online* is an indicator for having taken the survey online rather than face-to-face; it can be regarded as another interviewer fixed effect. *Time of day* (in hours, ranging from 7 am to 12 pm) provides an additional control for temporal correlates of shopper types.

2.3. Summary statistics

AnnualSpend ranges from $0 to $9600 with a mean of $1495, reflecting *AnnualSpend*'s asymmetric, J-shaped empirical distribution. The natural log of *AnnualSpend* is more nearly symmetrically distributed. The mean respondent's proportion of the household food budget spent at the OFM was 21%, ranging from zero to 92% with a markedly asymmetric empirical distribution. Just over half (51%) of respondents said they shopped at the market weekly.

Table 3 reveals that '50+' is the largest age category (where '18- to 29-year olds' are the omitted reference class). Our sample is more female (63%) than male (37%), which, by anecdotal accounts, would appear plausibly representative of the population of OFM shoppers. More than half of respondents have a university or postgraduate qualification (61%); buy free-range (60%) or organic (56%); and report having obtained local food from sources other than OFM (69%). Almost a third buys drinks or ready-to-eat items, using OFM as a café or street bistro experience (31%). The most frequently cited reason for buying food at OFM is freshness (52%). *Weather* is the most common barrier to spending more at the market (31%).

2.4. Hypotheses and the statistical models used to test them

Empirical models that include only demographics and geographic proximity would correspond to a (narrow) utilitarian theory that seeks to explain shopping behavior for local food as a function of budget constraints (proxied by household income), physiological constraints (proxied by age and gender), information constraints (proxied by education), and geographic proximity (as a proxy for time and transportation costs to shop for local food). In this utilitarian theory,

[7] It is well know that there is no logically coherent way to select a midpoint for the top income bracket which is theoretically unbounded ($150,000 to infinity). The greater the value chosen to represent the top income bracket, the more influence observations in the top bracket have. Conservatism guides the choice of $150,000 to represent the top income bracket, which was checked for robustness without overturning any important qualitative findings.

Table 2
Explanatory variables.

Variable	Definition
Demographics	
Age	1 if aged 18–29, 2 if aged 30–49, 3 if aged 50 or older
Male	1 if male, 0 if female
University	1 if has graduated from university or has postgraduate qualifications, 0 otherwise
Household Income (*HhIncome*)	Midpoint of household income brackets (in thousands of dollars) '<25', '25–50', '51–76–100', '100–125' and '>150'
Natural log of Household Income (*LnHhIncome*)	Ln(Midpoint of dollar *HhIncome* bracket)
Adults	1 if one adult lives in household, 2 if two adults, 3 if three or more adults
Children	1 if children live in household, 0 otherwise
Resides Outside of Dunedin (*OutsideDunedin*)	1 if respondent resides outside of Dunedin, 0 otherwise
Behaviors	
FreeRange	1 if shops at OFM for free range foods, 0 otherwise
Organic	1 if shops at OFM for organic foods, 0 otherwise
PreparedFood&Drink	1 if purchased drinks or food to eat outdoors
LocalOther	1 if purchases local food from somewhere other than OFM, 0 otherwise
Attitudes	
Service	1 if friendly service or interaction with vendors is a reason for shopping at OFM, 0 otherwise
Quality	1 if quality of products is a reason for shopping at OFM, 0 otherwise
Fresh	1 if freshness of products is a reason for shopping at OFM, 0 otherwise
Local	1 if local is a reason for shopping at OFM, 0 otherwise
Atmosphere	1 if atmosphere is a reason for shopping at OFM, 0 otherwise
Prices	1 if prices is a reason for shopping at OFM, 0 otherwise
Time	1 if time is main barrier to spending more at OFM, 0 otherwise
Weather	1 if weather is main barrier to spending more at OFM, 0 otherwise
Money	1 if money is main barrier to spending more at OFM, 0 otherwise
WTP	
WTPChina	Willingness to pay per kg for chosen produce item if from China
LnWTPChina	Ln(WTPChina + 1)
WTPUSA	Willingness to pay per kg for chosen produce item if from USA
LnWTPUSA	Ln(WTPUSA + 1)
China_Positive	1 if WTPChina > 0, 0 if WTPChina = 0
USA_Positive	1 if WTPUSA > 0, 0 if WTPUSA = 0
Variables for Robustness checks	
Time of day (in hours)	Hour interviewed, between 7am and 12 pm (for onsite interviewees, mean Time otherwise)
Interviewer fixed effects	Indicator variables for which interviewer conducted the survey
Online	1 if surveyed online, 0 if interviewed onsite at OFM

demographics and geographic proximity should do a reasonably good job of explaining which kinds of consumers are willing to pay more for localness as a hedonic attribute of food quality.

A somewhat richer conditional model of local food expenditures nests the demographics and proximity model as a parameter restriction within a larger, slightly more general, conditional model, by adding other consumer behaviors that could be used by local food sellers, marketers, activists or policy makers who share the goal of growing local food producers' market share. These models condition on self-reported shopping behavior regarding organic products, free-range products, and prepared food and drinks (e.g., cakes, jams, sandwiches, coffee sold for onsite consumption at the farmers market). The third and most comprehensive set of explanatory variables is referred to as the attitudes models. These models encompass the previous two by including the attitudes variables regarding positive and negative motivations for shopping at OFM.

Table 4 records the expected sign of each independent variable's marginal effect in our main empirical model of consumer expenditures at OFM. A number of these effects are theoretically indeterminate or have estimates from prior studies of both signs indicated in Table 4 by "?".[8] Even where an expected sign is reasonably straightforward based on theory, many empirical studies find that key demographic variables have statistically insignificant effects in regressions of consumer spending on food when controlling for behaviors and attitudes (e.g., Zepeda and Li, 2006).

Table 4 omits citations of theoretical and empirical references for brevity. The relevant theoretical and empirical studies are described elsewhere in this paper or, in some cases, the mechanisms are obvious and could therefore easily be modeled as hedonic utility maximization. For example, shoppers over 30 tend to earn more and have more education; therefore, one

[8] The directions of the effects of Male or Atmosphere are difficult to predict. See Govindasamy and Puduri (2010) and Gracia et al. (2012) for ethnic and gender differences in expressed preferences for local food. Other influences including ethnicity and social networks on food choice are analyzed by Kezis et al. (1998), Jekanowski et al. (2000), Stagl (2002), Wolf et al. (2005), Thilmany et al. (2008), Bond et al. (2009), Kemp et al. (2010), Wittman et al. (2012), Onozaka and Thilmany McFadden (2011); and Cappellini and Yen (2013).

Table 3
Summary statistics.

Dependent variables	Obs.	Mean	Std. dev.	Min	Max
Expenditure at OFM on day of survey (*Spend*)	125	42.33	36.88	0.00	200
Imputed Annual Spend (*AnnualSpend*)	125	1495	1911	0	9600
Natural Log of AnnualSpend (*LnAnnualSpend*)	125	6.17	1.94	0.00	9.17
AnnualSpend's Proportion of Total Food Expenditure (*PropAnnualSpend*)	115	0.214	0.220	0.000	0.923
Weekly Shopper (1/0) (*Weekly*)	129	0.512	0.502	0.000	1.000
Percentage Discount for Chinese Produce (*China-NZ Discount*)	62	0.621	0.458	-0.500	1.000
Percentage Discount for US Produce (*US-NZ Discount*)	59	0.557	0.466	-0.500	1.000
Percentage Discount for Non-Local NZ Produce (*NZ-Otago Discount*)	64	0.048	0.151	-0.500	0.333
Willingness To Pay for Local NZ Produce (*WTPNZ*)	69	6.84	5.93	1.00	42.00
Natural Log of WTPNZ (*LnWTPNZ*)	69	1.69	0.66	0.00	3.74
Explanatory variables					
Demographics and proximity to OFM used in the basic model conditioning on economic fundamentals					
Age = 30–49 Indicator (1/0)	128	0.297	0.459	0	1
Age = 50 + Indicator (1/0)	128	0.398	0.492	0	1
Male (1/0)	126	0.373	0.486	0	1
University Graduate (1/0)	128	0.609	0.490	0	1
Household Income (*HhIncome*)	122	60,635	49,073	12,500	1,50,000
Natural Log of Household Income (*LnHhIncome*)	122	10.64	0.91	9.43	11.92
Two Adults in Household (1/0)	128	0.430	0.497	0	1
Three or More Adults in Household (1/0)	128	0.227	0.420	0	1
Resides Outside of Dunedin (1/0) (*OutsideDunedin*)	128	0.125	0.332	0	1
Shopping Behaviors (product types that OFM shoppers come to purchase)					
FreeRange (1/0)	128	0.602	0.492	0	1
Organic (1/0)	128	0.563	0.498	0	1
PreparedFood&Drink (1/0)	128	0.313	0.465	0	1
Purchases Local Food from Sources Other than OFM (1/0)	127	0.685	0.466	0	1
Shopping Attitudes (expressed reasons for shopping at OFM)					
Service (1/0)	122	0.180	0.386	0	1
Quality (1/0)	122	0.287	0.454	0	1
Fresh (1/0)	122	0.516	0.502	0	1
Local (1/0)	122	0.361	0.482	0	1
Wants to Support Local Business (1/0)	122	0.262	0.442	0	1
Atmosphere Appealing (1/0)	122	0.336	0.474	0	1
Barriers to spending more or shopping more frequently at OFM					
High Prices (1/0)	122	0.164	0.372	0	1
Limited Hours of Operation (1/0)	117	0.171	0.378	0	1
Bad Weather (1/0)	117	0.308	0.464	0	1
Not Enough Money (1/0)	117	0.103	0.305	0	1
Willingness To Pay (WTP) for fresh food item from non-local place of origin (China, USA, Ex-Otago NZ)					
WTP for fresh food item grown in China (*WTPChina*)	68	1.87	2.87	0.00	12.00
Natural log of WTPChina (*LnWTPChina*)	68	0.67	0.84	0.00	2.56
WTP for fresh food item grown in USA (*WTPUSA*)	65	2.48	3.22	0.00	12.00
Natural log of WTPUSA (*LnWTPUSA*)	65	0.84	0.91	0.00	2.56
Nonzero WTP for Chinese product (1/0) (*China_Positive*)	68	0.426	0.498	0	1
Nonzero WTP for USA product (1/0) (*USA_Positive*)	65	0.492	0.504	0	1
Variables for robustness checks					
Time of day at which survey conducted (*Time*)	124	9.60	1.44	7	12
Interview conducted online (1/0) (*Online*)	137	0.168	0.375	0	1

The table above shows sample means, standard deviations and empirical ranges of the dependent variables for the main empirical models as well as for additional alternative dependent variables reported on primarily in Appendices. The number of observations are not consistent across all variables because some respondents did not answer all questions. In particular interviewers had difficulty asking and customers difficulty responding to survey items on WTP. Variables relating to WTP are also missing if the individual placed no positive value on lemons, tomatoes or garlic from any location. Hence there are smaller numbers of observations for these variables.

expects their expenditures on food items per time unit to be greater than under-30 shoppers (the omitted reference class in Table 4 and in subsequent models estimating conditional expectations). Regarding the indeterminate sign of the predicted effect of gender (Male variable in Table 4), one can reason in two opposing ways. On the one hand, men's larger body mass (on average) implies that they are expected to purchase larger quantities of food of all kinds, of which local food is one. On the other, social forces that lead to women specializing within the household in food production and gathering nutritional information would imply that they are expected to have more intense preferences for local food.

Continuing with the theoretical underpinnings for Table 4, we note that larger household size would, all else equal, imply greater demand for all kinds of food, including local food. Living farther away from OFM would of course decrease expected

Table 4
Expected signs of the marginal effects of independent variables on expected expenditure.

Variables	Expected sign of effect
Age = 30–49	+
Age = 50+	+
Male	?
University	+
LnHhIncome	+
Adults = 2	+
Adults = 3+	+
OutsideDunedin	–
FreeRange	+
Organic	+
PreparedFood&Drink	–
LocalOther	?
Service	+
Quality	+
Fresh	+
SupportLocal	+
Atmosphere	?
Prices	–
Time	–
Weather	–
Money	–

frequencies of attendance of therefore expenditure, all else equal.[9] Shoppers who express preferences for free-range and organic products would be expected to spend more and attend more frequently (once again, rather obviously). In contrast, those who attend OFM primary for prepared food items and products sold by the market's café-style vendors face narrower quantity constraints than those who shop for ingredients used in cooking during the entire week, which implies a negative expected sign on the variable *PreparedFood&Drink*.

Table 4 records the expected sign for the variable LocalOther (an indicator for purchasing local food from other, non-OFM sources) as indeterminate, balancing the negative substitution effect against the positive preference effect of having revealed a preference for local food already having found an alternative source. The expected signs of the following four variables are obvious: vendors' better *Service*; higher *Quality*; freshness or shorter duration spent in the supply chain as coded by *Fresh*; or the desire to support local business, *SupportLocal*.[10] The variable Atmosphere has an ambiguous sign because enjoyment of the atmosphere may be associated with more minutes purchasing or more minutes socializing, consuming or engaged in activities rival to minutes spent purchasing. The last four variables in Table 4 code barriers to spending more at OFM that respondents cite.

The natural log of imputed annual spend provides a basic behavioral metric that links observable characteristics of shoppers to their annual-expenditure-weighted importance for OFM. In contrast to this (log-transformed) *level* of spending, we also report empirical models of a dependent variable measuring *relative* expenditure on local food as a percentage of total food expenditure (including non-local food products from conventional grocery stores). Because frequency of shopping at OFM is arguably the most important consumer characteristic differentiating high- from low-annual-expenditure customers, we estimate a model of the probability of being a weekly shopper (i.e., the most frequent rate of shopping at OFM possible, given that it is a weekly, Saturday-only market). We also estimate Tobit models of a dependent variable measuring individual-level subjective discounts (censored at zero) applied to otherwise identical US versus NZ produce. We focus on these four dependent variables measuring key aspects of shopping behavior at OFM: the individual's estimated annual spend on food at OFM; the proportion of the individual's household's total annual food spending spent at OFM; a binary variable for whether the individual is a frequent (i.e., weekly or near-weekly) shopper versus occasional shopper at OFM; and an individual-level willingness-to-pay (WTP) premium for local versus non-local produce.

Annual spend is modeled using ordinary least squares (OLS), with further robustness checks and a two stage least squares (2SLS) estimation to account for potential endogeneity of variables relating to items purchased at OFM. A fractional Probit model (Parke and Wooldridge, 1996; Wooldridge, 2000) is used for the OFM proportion of the individual's food budget to account for this variable's boundedness (between zero and one). The probability of shopping weekly is estimated using a

[9] Geographic distance from shopper's residence to OFM could have been used instead of the coarser binary measure. Experimenting with distance measures, log transformations, and other model specifications taking into account the importance of hills in forming Dunedin shoppers' perceptions of geographic proximity (i.e., 3-dimensional spatial variation rather than 2-dimensional distance), we decided that most empirical insights were adequately captured by the more simply coded variable.

[10] Instruments measuring social norms of various kinds could have been employed (cf., Watkins et al.'s, 2016, finding that NZ consumers tend to be frugal and care about environmental sustainability, and Stephenson et al., 2015, on NZ consumer decisions about energy). Wanting to support local business overlaps in different ways with other measures of social norms, however, which would have led to multicollinearity and weakened our ability to measure the role of this frequently stated motive plays.

Probit model reported using average marginal effects. These empirical models, once estimated, are used to simulate counterfactuals that generate predictions regarding how consumers might respond to an expansion of the availability of local food (e.g., hours in operation, physical location, product range, prices, etc.). WTP models are specified to provide income- and age-elasticities of WTP premiums for local food.

Measures of spend at the OFM (in either a single visit or yearly) refer to spend *on food*. We measured both total spend (including non-food items) and expenditure specifically on food during a typical visit to OFM. The data reveal that 93.8% of total spend was on food.

2.5. Descriptive analysis

This section presents bivariate relationships without controlling for the rest of the explanatory variables as in the Results section that follows. Fig. 3 shows a scatterplot of household income and *AnnualSpend* that demonstrates an obvious increasing relationship between household income and annual expenditures among OFM shoppers. The unconditional mean of *AnnualSpend* is $1289. The bivariate distribution in Fig. 3 reveals good statistical variation in *AnnualSpend* within each household income bracket.

Different subpopulations would naturally have different income elasticities of *AnnualSpend*. Appendices 2 and 3 show six scatterplots of household income and *AnnualSpend* broken out into subsamples (mutually exclusive and exhaustive) based on shopping behaviors. The highest spenders have one obvious feature in common: they shop at OFM as frequently as possible (i.e., weekly shoppers are the most loyal consumers and therefore tend to spend more than non-weekly shoppers). Perhaps not surprisingly, free-range and organic shoppers, as well as those who obtain local food from other sources, tend to be concentrated in the upper tail of the OFM expenditures distribution. Consistent with intuition once again, shoppers who attend OFM primarily to purchase prepared food and those who cite prices as a major barrier tend to have lower-than-average *AnnualSpend*. The subsample of respondents with simultaneously positive values of *Weekly*, *Organic*, *FreeRange*, *LocalOther* and zero values for *PreparedFood&Drink* and *Prices* spend substantially more at OFM across all household income levels.

3. Results

Results are presented in three subsections: customer shopping behavior at OFM, WTP for local production, and robustness tests. We are interested in how inclusion of each group of variables affects the coefficient estimates, with primary interest on the fully conditional models that include all right-hand-side variables in each empirical model's final specification.

3.1. Estimated empirical models of OFM shopping behavior

Table 5 shows the results of the OLS estimates of three empirical models of *LnAnnualSpend*. When only demographic variables are included as in Model 1 in Table 5, age has a noticeably large conditioning effect: over-50 status is associated with an increase in expected annual spend 303% ($e^{1.394} - 1 = 3.03$) greater than for an 18-to-29-year-old whose other characteristics are the same. This age effect loses statistical significance in Model 3, however. These results suggest a number of interesting challenges for marketers of local food regarding how best to use information about demographics and individual preferences. While it appears that older people tend to do more shopping at OFM, this pattern is largely explained by them having

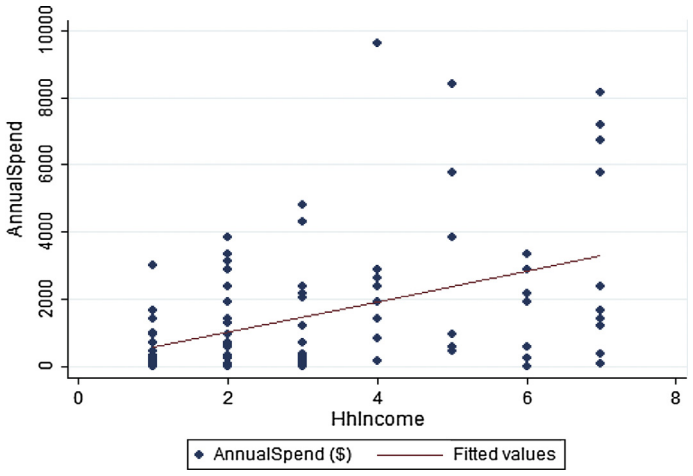

Fig. 3. Bivariate distribution of AnnualSpend and HhIncome. The bivariate regression line has a statistically significant slope of $982 (change in expected annual OFM spend per doubling of household income) and mostly unexplained variance.

Table 5
OLS estimates of three empirical models of LnAnnualSpend.

Variables	Model 1 Demographics	Model 2 +Behaviors	Model 3 +Attitudes
Age = 30–49	0.535	0.658	0.0911
	(0.457)	(0.412)	(0.441)
Age = 50+	1.394***	1.212***	0.181
	(0.427)	(0.388)	(0.427)
Male	−0.262	−0.244	−0.112
	(0.314)	(0.286)	(0.302)
University	0.113	−0.173	0.156
	(0.355)	(0.317)	(0.343)
LnHhIncome	0.718***	0.601***	0.781***
	(0.220)	(0.198)	(0.224)
Adults = 2	0.149	0.206	0.101
	(0.370)	(0.324)	(0.348)
Adults = 3+	0.225	0.407	0.597
	(0.418)	(0.369)	(0.379)
Children	−0.286	−0.361	−0.453
	(0.455)	(0.407)	(0.417)
OutsideDunedin	−1.860***	−1.814***	−1.975***
	(0.487)	(0.427)	(0.495)
Constant	−1.933	−1.251	−2.276
	(2.138)	(1.942)	(2.159)
P-value for null of Demographic variables jointly zero	0.0000***	0.0000***	0.0003***
P-value for null of Behavioral variables jointly zero		0.0059***	0.0041***
P-value for null of Attitudes variables jointly zero			0.0366**
Observations	113	111	96
R-squared	0.381	0.512	0.605
Adjusted R-squared	0.327	0.447	0.485

Standard errors appear in parentheses: ***p < 0.01, **p < 0.05, *p < 0.1. Complete empirical models with coefficients on *Behaviors* and *Attitudes* variables are contained in Appendix 11.

different attitudes (cf., Szmigin et al.'s (2003) argument that 'sense of community' at farmers markets may be particularly appealing to older consumers).

The coefficient on *LnHhIncome* provides a measure of income elasticity of OFM expenditure, which is positive and significant at the one percent level across all three models in Table 5. The third model predicts that every one-percentage-point increase in household income is associated with a 0.78% increase in annual spend, which is a large-magnitude effect that links to a long and substantial literature in economics. Income elasticity less than unity is consistent with the idea that food is a necessity, consistent with Engel's Law (i.e., that households spend smaller portions of their income on food as their incomes increase, cf., Calhoun, 2002). The absence of gender effects in our data is noteworthy. There is also no significant effect of the number of adults or the presence of children in the household. The number of people in one's household does not appear to be a key driver of expenditures at OFM; being busy with children's activities on Saturday mornings also does not appear to constrain expenditures (which makes sense, given that this sample is selected to include only shoppers). Perhaps most importantly in Table 5 are the consistently large-magnitude effects of physical proximity: residing outside of Dunedin (i.e., where it takes more time to travel to OFM, where OFM is less visible, and where OFM is coded more weakly in potential consumers' minds, e.g., less frequent random encounters with other OFM shoppers) has a sharply negative effect on expected annual spend across all models.[11,12] Several joint test results in the form of p-values associated with multiple parameter restrictions are reported in the last rows of Table 5. From these test results, we see that demographic, behavioral and attitude variables are all jointly significant across all models in which they are included at least at the five percent level.

[11] The full empirical models including all coefficients on the Behaviors and Attitudes variables are relegated to Appendices. Some effects from those results are worth mentioning. Expressing a preference for *FreeRange* food is sometimes associated with increased expected annual spend (by as much as 139%), although this effect becomes small and statistically insignificant after attitude controls are included. Expressing a preference for *Organic* food is, surprisingly, nowhere statistically significant. Although the attitude variable coding expressed attraction to OFM based on superior *Service* occasionally has large effects on levels and proportions of OFM expenditures, it would appear that shopping frequency is the more important channel through which perceived advantages provided by OFM vendors and their superior service affect *AnnualSpend*. As one would expect, price sensitivity (indicated by the attitudes variable *Prices*) or having mentioned *Time* or *Weather* as barriers to spending more at OFM were all negatively associated with *AnnualSpend*. *Time* had a particularly large effect reducing expected *AnnualSpend*.

[12] Appendix 4 provides further results using the same model specifications but for the dependent variable *Spend* (on the day of the survey rather than imputed *AnnualSpend*). Marginal effects in a Probit model of *Weekly* (reported subsequently) suggest that *PreparedFood&Drink* is a predictor of fewer shopping days per year and has a negative overall association with expected spend, even within a single shopping trip.

Table 6
Fractional probit average marginal effects of three empirical models of PropAnnualSpend.

Variables	Model 1 Demographics	Model 2 +Behaviors	Model 3 +Attitudes
Age = 30–49	0.0502	0.0407	−0.0185
	(0.0489)	(0.0522)	(0.0613)
Age = 50+	0.134**	0.107*	−0.0194
	(0.0537)	(0.0555)	(0.0599)
Male	−0.0223	−0.0257	−0.000680
	(0.0410)	(0.0398)	(0.0452)
University	0.0337	0.0201	0.0401
	(0.0437)	(0.0419)	(0.0523)
LnHhIncome	0.0251	0.00929	0.0390
	(0.0261)	(0.0271)	(0.0312)
Adults = 2	0.00514	0.00686	0.0196
	(0.0483)	(0.0459)	(0.0492)
Adults = 3+	−0.0308	−0.0147	0.00573
	(0.0508)	(0.0518)	(0.0516)
Children	−0.0655	−0.0477	−0.0992**
	(0.0490)	(0.0460)	(0.0434)
OutsideDunedin	−0.166***	−0.156***	−0.198***
	(0.0334)	(0.0352)	(0.0279)
P-value for null of Demographic variables jointly zero	0.0000***	0.0022***	0.0000***
P-value for null of Behavioral variables jointly zero		0.0246**	0.0003***
P-value for null of Attitudes variables jointly zero			0.0001***
Observations	106	104	90

Standard errors appear in parentheses: ***p < 0.01, **p < 0.05, *p < 0.1. Complete empirical models with coefficients on *Behaviors* and *Attitudes* variables are contained in Appendix 12.

In Table 6, we continue investigating OFM expenditures by changing the specification of the dependent variable to the proportion of OFM expenditures in total household food expenditures, *PropAnnualSpend*. Using the fractional Probit model (Baum, 2008) which is appropriate for a dependent variable constrained between 0 and 100%, Table 6 presents mean marginal effects on the expected proportion of total annual food expenditures spent at OFM. The unconditional base rate (mean proportion) is 0.213 = 21.3% (from Table 3). The marginal effect of *OutsideDunedin* in Model 1 of Table 6 is −0.166***. This effect should be interpreted as the shopper with mean characteristics being expected to spend 16.6 percentage points less of their annual food expenditures than if he or she had resided in Dunedin. Consistent with previous results, the marginal effects in Table 6 reveal positive effects of age (over-50 status) in Model 1, although with diminishing significance as more conditioning information is included. Consistent with Table 5, the models in Table 6 reveal no important effects of gender and education (perhaps because such differences are captured by other variables in the model). In contrast to models of *AnnualSpend* considered in Table 5, Model 3 in Table 6 shows that *PropAnnualSpend* is negatively associated with having Children (declining by almost 10 percentage points). This effect is likely relevant to marketing strategies focused on raising awareness of farmers markets across different socioeconomic brackets and household types, as is the null result in Table 6 regarding income.[13]

Table 7 shows average marginal effects in the Probit model of the probability that an individual is a weekly shopper (conditional on all right-hand-side variables previously reported in Tables 5 and 6).[14] The association between household income and the probability of being a weekly shopper is a large-magnitude effect in Table 7: a doubling of income is associated with a 20-percentage-point increase relative to the unconditional rate of being a weekly shopper of 51%, which is a (71%−51%)/51% = 39% relative increase. Having children reduces the conditional probability of being a weekly shopper at OFM (in contrast with Table 5). Unlike the income and geographic proximity effects that were large and robust across all three model specifications in Tables 5 and 6, the effects of household income and geographic proximity (*OutsideDunedin*) are attenuated by more than two thirds in Table 7 after including Behaviors and Attitudes controls.[15]

[13] Not shown explicitly in Table 6 is the coefficient on the Attitudes variable *Local*. When a shopper expresses an attitude in favor of locally produced products as a reason for shopping at OFM, it has a significantly positive effect on *PropAnnualSpend* but not on *AnnualSpend*. These different results across different dependent variables imply that OFM shoppers, instead of spending more at OFM, may simply spend less on food elsewhere.

[14] The absence of strong income effects on the *PropAnnualSpend* in Table 6 should therefore not be interpreted as discouraging to those interested in expanding local foods markets.

[15] Respondents who say they come to OFM to purchase drinks and prepared food are far less likely to be weekly shoppers (shown in Appendices). Those who mentioned *Service* or *Quality* as a main reason for shopping at the market were 25 and 20 percentage points more likely to be weekly shoppers. In our data, the variable *Service* seems to be an especially powerful motivator for OFM customer loyalty (as measured by being a weekly shopper). The barriers variables in Table 7 show unsurprising negative associations: *Time* and (bad) *Weather* are associated with 30- and 22-percentage-point reductions in the likelihood of being a weekly shopper.

Table 7
Average marginal effects in probit models of the probability of being a weekly shopper.

Variables	Model 1 Demographics	Model 2 +Behaviors	Model 3 +Attitudes
Age = 30–49	−0.235	−0.0750	−0.155
	(0.382)	(0.115)	(0.102)
Age = 50+	0.186	0.0229	−0.197**
	(0.358)	(0.111)	(0.0899)
Male	0.174	0.0576	0.0530
	(0.275)	(0.0844)	(0.0863)
University	0.157	0.0302	0.0425
	(0.303)	(0.0963)	(0.108)
LnHhIncome	0.697***	0.202***	0.199***
	(0.197)	(0.0514)	(0.0522)
Adults = 2	−0.0575	−0.0221	0.133
	(0.318)	(0.0959)	(0.100)
Adults = 3+	−0.0130	−0.00786	0.0576
	(0.357)	(0.108)	(0.100)
Children	−0.674*	−0.170	−0.253**
	(0.406)	(0.116)	(0.111)
OutsideDunedin	−1.718***	−0.475***	−0.440***
	(0.597)	(0.0883)	(0.117)
P-value for null of Demographic variables jointly zero	0.0073***	0.0000***	0.0000***
P-value for null of Behavioral variables jointly zero		0.0075***	0.1046
P-value for null of Attitudes variables jointly zero			0.0000***
Observations	116	114	98
Pseudo R-Squared	0.194	0.273	0.437

Standard errors appear in parentheses: ***p < 0.01, **p < 0.05, *p < 0.1. Complete empirical models with coefficients on *Behaviors* and *Attitudes* variables are contained in Appendix 13.

3.2. Explaining consumer premiums for local food

We model consumers' subjective premiums as percentage changes in WTP (discounts relative to a local item applied to a non-local item). These percentage changes are relative to the local food item. All respondents have strictly positive WTPNZ.

When estimating the premium measure for WTP for a domestically produced food item compared to an imported item, there is a sizable concentration of individuals with zero WTP for the foreign product which we account for using Tobit estimation. We apply a Chow test of whether the variables that influence consumers' WTP for local food follow a common conditional mean function (as opposed to distinct conditional mean functions) for consumers who are, alternatively, willing versus unwilling to purchase imported food. Our variable measuring consumers' WTP premium and its conditional expectation may provide guidance on how to local food economies can generate more value to consumers. Our simple preference elicitation schemes demonstrate how contrasting definitions of willingness to pay for local food could be relevant—and measurable—using well-defined scenarios that involve common products from specific countries and regions within NZ. The WTP variable is a continuous rather than binary or ordinal outcome variable. The extant literature provides few prior students with such a rich set of consumer demographics, behaviors, and attitudes toward farmers markets that can be statistically associated with a continuously valued WTP premium for local food production. We compare the WTP premium for NZ versus imported products from China and the WTP premium for NZ versus U.S. to reveal how sensitive the local-food WTP premium is to the source country. We also measure a WTP premium for Otago-region local over non-local-NZ produce.

Table 8 presents average marginal effects from a Tobit model of *US-NZ Discount*, which measures the consumer's subjective discount applied to the value of an otherwise similar US- versus NZ-produced food item. This variable is censored with a cluster of observations at zero. A discount of zero corresponds to a respondent who is indifferent between US and NZ items and therefore has equal (and strictly positive) WTP for both items. Results of a similar model for *China-NZ Discount* are presented in Appendix 5. The results suggest that consumers over the age of 29 may be likely to discount US-produced food more than younger people. Surprisingly, Table 8 shows that individuals with higher education have, on average, a 24-percentage-point *smaller* discount after controlling for other characteristics compared to the unconditional mean discount of 56%. Table 8 is the first of our results tables that show significant effects of education, implying *less* suspicion about consuming foreign food among those with more formal education: more education would appear to be associated with greater acceptance of foreign food. A doubling of household income is associated with a 26-percentage-point larger discount; this effect is intuitive insofar as higher-income respondents can afford to pay more for their local food preference (cf., Luomala, 2007; Ozretic-Dosen et al., 2007).

Table 8
Tobit model of US-NZ discount, average marginal effects.

Variables	Model 1 Demographics	Model 2 +Behaviors	Model 3 +Attitudes
Age = 30–49	0.615***	0.526***	0.319***
	(0.167)	(0.167)	(0.105)
Age = 50+	0.665***	0.534***	0.178
	(0.155)	(0.171)	(0.164)
Male	−0.228*	−0.181	−0.0136
	(0.121)	(0.117)	(0.0761)
University	−0.0797	−0.133	−0.242**
	(0.107)	(0.126)	(0.109)
LnHhIncome	0.115	0.157**	0.261***
	(0.0707)	(0.0735)	(0.0557)
Adults = 2	−0.310**	−0.328**	−0.302**
	(0.140)	(0.137)	(0.119)
Adults = 3+	−0.0414	−0.0363	0.0319
	(0.119)	(0.116)	(0.0738)
Children	0.238*	0.209	0.148
	(0.133)	(0.139)	(0.155)
OutsideDunedin	−1.136*	−0.813	−0.898**
	(0.633)	(0.607)	(0.444)
P-value for null of Demographic variables jointly zero	0.0000***	0.0000***	0.0000***
P-value for null of Behavioral variables jointly zero		0.4249	0.0001***
P-value for null of Attitudes variables jointly zero			0.0000***
Observations	51	50	48
Number of censored observations	26	25	25
Pseudo R-squared	0.361	0.394	0.800

Standard errors appear in parentheses: ***p < 0.01, **p < 0.05, *p < 0.1. Complete empirical models with coefficients on *Behaviors* and *Attitudes* variables are contained in Appendix 14.

Results for *LnWTPNZ* conditional on *WTPChina* are reported in Appendix 6 and similarly for *LnWTPNZ* conditional on *WTPUSA* in Appendix 7. The setup of these models allows a Chow Test to be performed to test equality of coefficients across two groups of consumers: those willing to buy foreign produce for some finite, positive price and those who are unwilling to buy foreign at any price. The p-values for those Chow Tests are reported at the bottom of Appendices 6 and 7, suggesting that the coefficients common to both of these two subpopulations are statistically different at (at least) the 5% level in Model 1 (although with fading significance as more conditional information is included).

3.3. Robustness

A robustness check for possible interviewer effects includes *Interviewer* fixed effects and *Time of day* in more heavily parameterized models of *LnAnnualSpend* (Appendix 8). Interviewer effects are not jointly significant at the five percent level. The size and significance of other estimated effects are fairly consistent with the estimates presented in the main tables. In some specifications, *Time of day* has a strongly negative effect on annual spend, implying that being interviewed one hour later is associated with decreased expected annual spend by as much as 26 percentage points in Model 3 of Appendix 8 ($e^{-0.302} - 1 = -0.261$). It could be that high spenders are concentrated temporally in the early hours of operation.

Regarding endogeneity, Appendix 9 shows 2SLS estimation of empirical models of *LnAnnualSpend.* One could also raise reasonable concerns about the possibility of endogeneity with respect to preference profiles such as *WTPChina* > 0 or *WTPUSA* > 0. We ran an endogenous treatment effect model as suggested by Cong and Drukker (2000) using STATA's "etregress" command. This command estimates a linear model of *WTPNZ* conditional on WTP for the foreign item and the other independent variables, augmented with an endogenous binary treatment variable. The binary decision to buy the foreign product is specified as if it were based on an unobserved latent variable, assumed to be linear in the other independent variables in the model. Although there is some sensitivity to choice over which right-hand-side variables are omitted to fulfill exclusion restrictions, results for the model conditional on *WTPChina* > 0 versus = 0 are reported in Appendix 10, revealing a substantial negative treatment effect: positive WTP for the Chinese product reduces expected *WTPNZ* by $8.80.

4. Discussion and conclusion

In the conceptual framework of hedonic utility generated jointly from the attributes of food items and the institutional characteristics of local food markets, localness was the main attribute we focused on in the analysis above. After controlling

for numerous other attributes of food and institutional characteristics, the data revealed that localness had measurable and positive effects on consumer wellbeing as measured by our three dependent variables interpreted as proxies for utility.

Our empirical analysis focused on the goal of wanting to better understand how OFM customers evaluate localness in terms of WTP in units of dollars per kg. The data revealed large preferences among OFM shoppers for domestic produce over produce from the U.S. or China. On average, OFM customers were willing to pay 56% less for US produce and 62% less for Chinese rather than NZ produce. In contrast, there is very little measurable WTP premium for Otago regional produce in general (although there is solid appreciation expressed for Otago region Pinot Noirs and a few other region-specific products).

The data revealed two distinct subpopulations of consumers. One group was willing to purchase both NZ and foreign produce items, substituting based on attractive pricing (i.e., internal rate of exchange between local versus non-local given by market prices). The second group expressed zero WTP for foreign produce (i.e., was willing to pay a positive price only for NZ produce). Although it may seem obvious that farmers markets attract consumers with strong preferences for local food, our data can just as easily be interpreted as revealing the surprisingly finding that well more than 40% of OFM customers placed positive value on at least some foreign food items (42.6% China_Positive and 49.8% USA_Positive in Table 3, and the two thirds of the sample with uncensored observations in Table 8).

The characteristic that most consistently influenced observed shopping behavior at OFM was household income. Consistent with orthodox microeconomic theory (under the standard assumption that OFM food is a normal good), the data showed that OFM expenditures were increasing in household income across virtually all measures of revealed preference for OFM shopping. The income elasticity measure we estimated, conditional on all other dependent variables, predicts that a one percent increase in household income is associated with a 0.78% increase in annual spend. Households with 10% greater income are expected to spend 7.8% more, all else equal. Households with double the average income are expected to spend 78% more. The importance of household income suggests a potential opportunity for those wanting to expand markets for local food. Insofar as marketing, taste shifters and other incentives can be targeted at the lower half of the income distribution (making farmers markets and local food more appealing to lower-income households), then the local food market could expand substantially more because lower-income households also spend substantial amounts on food.

Being over 50 years old and having higher household income were prominent among the consumer characteristics expected to increase both annual spending at the famers market and W\TP for local production. This statistical generalization reflects theoretical predictions based on standard consumer theory based on age, education and income. Those who did not purchase ready-to-eat food or drinks or resided at a substantial distance from the farmers market (cf., Eastwood et al., 1999) tended to have lower annual spend at OFM and lower WTP for local produce in general. Stated consumer preferences for "good service" (i.e., "friendly" vendors and the possibility to "interact" face-to-face, cf., Berg et al. (2010) and Berg et al. (2013)) were positively associated with OFM shopping behaviors, once again, in line with intuition.[16] Our data also revealed that the effects of stated preferences for free-range or organic food were not as strong as theory might suggest.

Several variables were seen to have significant effects on WTP for localness but not on OFM expenditure, namely: aged 30–49 (compared to a reference category of 18–29 year olds); having a preference for organic foods at OFM; and shopping at OFM because the products are local; or because of its atmosphere. These characteristics were associated more strongly with valuing localness although this fact did not necessarily translate into higher spending. Such gaps between intentions as described by respondents and actual behaviors are, of course, well known (Young et al., 1998) and consistent with the vast literature on survey methodology.

Weather as a "barrier" was negatively associated with expenditure at OFM, but this negative association was insignificant in models of WTP for localness. The data suggested that limited hours of operation as a barrier may be among the most important institutional characteristics of local foods markets that could be improved to induce more participation and spending. Potential institutional changes designed to attract new customers to the market and generally increase revenue could therefore focus on weather and hours of operation based on the evidence in our data. The most frequent OFM shoppers tended to come mainly for groceries, while those who attended more occasionally were attracted more strongly to the market's café culture. This was another measurable divide across consumers relevant to marketing and institutional design for expanding the appeal of the farmers market.

Several limitations of our data should be acknowledged. Small sample sizes obviously limit the precision with which conditional expectations (even if correctly specified) can be estimated. Selection bias is a potential issue in any survey as is generalizability. Our attempts to station interviewers roughly uniformly across the spatial distribution of OFM reflected many attempts at avoiding obvious selection biases. Unfortunately, our data do not provide information as to whether those who refused to be surveyed were statistically different from those who responded. OFM organizers perform a daily count of shoppers once per year. For the past two years, this count has been approximately 7500 (email sent to authors by OFM General Manager Vercoe, July 22, 2015). The 137 respondents we reached covers around 2.1% of the estimated population of shoppers on a typical shopping day. Controls included in the survey design and methodological choices about statistical techniques were used to try accounting for temporal and spatial concentrations of shoppers with special characteristics (e.g., shoppers who tend to shop at a particular time or are fans of one particular vendor or location). Future work could further investigate the apparently lexicographic preference for localness revealed by our data (i.e., the question of why some

[16] Although they were unable to detect empirical evidence of it, Westervelt and Hawkins (1979) used a Maslow-inspired framework to argue that, at least in theory, some consumers may seek self-actualisation through shopping.

consumers are willing to purchase foreign produce, while others place zero value on foreign food items[17]) and apply our elicitation of WTP for localness on other samples and populations.

Regarding generalizability, we believe that food-shopping behavior is, most likely, profoundly heterogeneous and that out-of-sample generalization would be (generally) speculative.[18] Nevertheless, it stands to reason that geographic proximity—and therefore, the design of transportation networks, policies that determine patterns of land use, and other institutional variables that could affect the distances required to find local food—would have similarly important effects across different cities, cultures and countries. It also seems reasonable that the main effects on local food expenditures other than proximity—income effects and age effects—would be among the most generalizable effects across local, regional and national cultures. Regarding WTP premiums for local food, we imagine that many populations of shoppers can be dichotomized as compensatory versus non-compensatory subpopulations (cf. Gigerenzer et al., 1999). One subpopulation (with compensatory preferences) applies a finite discount rate to non-local food while the other (non-compensatory) subpopulation applies what is effectively an infinite discount rate by refusing to buy non-local food regardless of its price. Our data comparing non-local food imported into NZ from the US and China reveal significant numbers of NZ shoppers who prefer local produce, are willing to accept US imports when discounted appropriately, but would choose not to purchase a Chinese product of similar quality no matter how cheap. This finding suggests that the qualities and reasons for expressing preferences over local food are multidimensional. There can be subtleties that differentiate preferences over places of origin for food products that involve distinctions not captured by the coarse binary classification of local versus non-local.

The results identify both challenges and opportunities for expansion of OFM and surrounding local food economies. The data show that older people and those with higher household income tend to be more committed to shopping at OFM with greater subjective valuation on the localness of food. The subset of OFM consumers whose primary reason for being there is to enjoy its café culture (e.g., purchasing ready-to-eat food and drinks), quite predictably, consists of less loyal patrons of OFM with lower WTP for local food *per se*. Consumers who say they favor OFM because its products are local do not, on average, have greater annual spend at OFM, although the proportion of their annual food budget spent at OFM is significantly greater (cf., Mirosa and Lawson, 2012). The conditional probability of being a frequent (i.e., weekly) shopper is also significantly greater among consumers with expressed preferences for local food. Among the strongest predictors of being a high-frequency shopper are perceptions of advantages of OFM vendors in the areas of "good service" and high-quality products. Unsurprisingly, respondents who mentioned bad weather or limited hours in which the market is open as barriers to shopping at OFM are significantly less likely to shop frequently or spend as much over a year. The Chow Test suggests that the way in which covariates affect WTP for a NZ product is no different among those willing versus unwilling to purchase foreign products.

Weekly shoppers are the most loyal OFM customers. Because their frequency and expenditures are already at the extreme end of the empirical range, it seems rather unlikely that marketing to these already-loyal customers could increase sales by much. From a bottom-line value-for-money analysis of marketing expenditures, it may make more sense to target less loyal consumers who are not yet convinced of the value of shopping at farmers market. Communication strategies targeting potential consumers without an expressed preference for local food could prove, perhaps counter-intuitively, effective at growing the local food market. The main take-away in our view, however, is that the economic fundamentals—the personal costs of transportation from place of residence to local food markets, chief among them—are the primary drivers of patterns of food consumption. Geographic proximity to local food, together with sufficient income and information about the benefits of consuming local food, should be among the primary considerations and target variables for policies intending to encourage consumption of local food.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.tra.2017.07.001.

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[17] An intriguing possibility is that consumer heterogeneity can, in part, be explained by different emphases on visual versus non-visual cues about food characteristics and their mapping into health and wellbeing (Chrysochou and Grunert, 2014). Data collection from non-shoppers about why they do not shop at the farmers market (e.g., limited operating hours, limited product range, prices, etc.) would also be a worthwhile direction for future research.

[18] Statistical models of conditional expectations functions (e.g., regression models) depend unavoidably on untested assumptions about which evidence-based quantifications of confidence are rare outside of simulation analyses in which the true data-generating process is known.

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