An Online Survey of Chinese Familiarity With and Attitudes Towards Pecans

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China is an important export market for U.S. pecan producers, yet the little that is known about pecan consumption in China is based mostly on anecdotes. In an effort to better understand this important market, an internet survey of over 900 Chinese residents is conducted, inquiring into how well they can recognize pecans, their consumption of pecans relative to other nuts, the relationship between demographics and pecan consumption, and their general attitudes towards pecans. Results show that pecans are recognized and frequently consumed in China, though not as much as other nuts; that pecan consumption varies little across the vast regions of China; that consumers prefer their pecans to be cooked and flavored; and that pecans are superior to walnuts (a more popular nut) in regards to losing weight, taste, and being easy to crack and eat.

Key words: Exports to China, Nut Consumption in China, Pecan, Pecan Consumption, Pecan Consumption in China

Pecans are the fourth most important tree nut in the United States, each year producing more than $500 million in value (Perez, 2019). While U.S. pecan production in the last five years is only about 10% higher than it was in the early 1980s, reliance on export markets has risen considerably. Average annual exports in the 1980s were only 4.8 million pounds (shelled basis), but, in the last 10 years, the United States has always exported more than 50 million pounds each year, and in the 2017-18 harvest year, exports totaled 113 million pounds (U.S. Department of Agriculture (USDA), Economic Research Service (ERS), 2020). China is currently the largest export market (Arn, 2018), making understanding this market essential for the sustainability of U.S. pecan exports.

Little is known about the nature of pecan production in China. While nuts in general seem to have been an important Chinese food for some time, especially during spring festivals (Zhao, Gangliu, and Wang, 2015), pecans have only recently been included. Consumption of pecans is thought to have risen considerably in 2008 when a shortage of walnuts in China and a surplus of pecans in the United States induced Chinese consumers to substitute pecans for walnuts (Hargreaves, 2013; Zhang, Peng, and Li, 2015). Pecans are now a well-known food in parts of China, which is remarkable given that they were virtually unknown 10 years prior.

The first U.S. pecan exporter to China is thought by the U.S. pecan industry to have been the Hudson Pecan Company LLC. Frustrated with low domestic pecan prices, Randy Hudson sought to sell in China. He first attempted to work through official government and industry channels, but

this proved fruitless because Chinese importers did not know what a pecan was. There was no Chinese word referring to pecans, despite the fact that U.S. government programs had funded pecan marketing programs aimed at Asia, though most of those programs focused on exporting to Japan (Onunkwo and Epperson, 2000). Hickory, almonds, and cashews did have a place in both Chinese vernacular and in its stores, but pecans did not. The best indicator of pecan's absence from China was its absence from the Red Book, a document listing tariffs applying to Chinese imports. When Hudson took some of his pecans to a trade show around 1999 and told Chinese attendees they were pecans, many tried to correct him and said they were actually hickory nuts. There was no evidence that anyone in China, save for those who had traveled abroad, ever saw, ate, or knew of the pecan.

One Shanghai buyer at the show was particularly interested in importing pecans, but was more interested in a trade than a purchase, so Hudson agreed to trade one shipping container (39 m3) of pecans for a half container of walnuts. In hopes of acquiring a permanent buyer, Hudson sent only high quality pecans, those of the Desirable variety. The buyer apparently liked the pecans and found a market for them, for he purchased more and, with persistent effort at Chinese trade shows by growers and the Southern United States Trade Association, Hudson and other growers now export large volumes of pecans to China (Hudson, 2017).

U.S. pecans now have a permanent home in China. Of the 294 million lbs. of pecans produced in the 2017-18 marketing year, on an in-shell basis, 38% were exported with 36% of those exports going to China (mainland and Hong Kong) specifically (American Pecan Council, 2019; ERS, 2020). China is considered a promising market because of growing exports, increasing trade liberalization between the United States and China, the prominence of nuts in the Chinese diet, and its high population.

Figure 1. Importance of Chinese Export Market to the U.S. Pecan Industry.

Figure 1 shows U.S. pecan exports to mainland China and Hong Kong, illustrating that most exports are in the form of in-shell pecans. Chinese consumers most commonly purchase pecans in cracked shells (cracked to make peeling the shell easier), which are already flavored in brine and roasted (Medrano, 2012). While nuts are consumed year-round, they are especially favored as gifts during Chinese New Year celebrations (Zhao, Gangliu, and Wang, 2015). Figure 1 demonstrates that exports to China can be particularly volatile, comprising half of all exports in one year and only 10% of exports 10 years later. Notice also that, in recent years, the value of U.S. pecan production tends to rise and fall with exports to China, demonstrating the importance of this market to U.S. pecan producers, who lately have been losing market share to Mexico (USDA, Foreign Agricultural Service (FAS), 2020).

The recent and speedy success of United States exports to China verifies Onunkwo and Epperson's (2000) estimates that promotion of U.S. pecan exports to Asian countries can experience high returns, a finding that arises for other U.S. nuts like almonds as well (Onunkwo and Epperson, 2001). Indeed, in describing the 2000% increase in U.S. pecan exports since 1980, one author describes the opening of the Chinese market as "the most significant" event (Wells, 2014, p. 475), and was attributed to China's growing middle class. This matches previous literature in the 1980s suggesting the failure of pecan exports to grow as almonds did was due to pecan's higher price and the almond industry's greater efforts to develop new export markets (Glover and Miller, 1986).

The United States is not the only country interested in exporting pecans to China. Nadler, Chen, and Lu (2017) report that Australia and South Africa have also found a market for pecans in China due to their lower shipping costs and their unique ability to provide fresh nuts during China's spring festivals, during which nut consumption rises considerably. China's role in the U.S. pecan industry has provided a profitable market but its potential loss to rivals introduces uncertainty in the pecan industry. The profitability of a pecan oil and flour extraction company in the United States, for example, depends on whether China's pecan demand continues to place upward pressure on U.S. pecan prices (Cockerham et. al., 2012). China's role in the pecan industry thus affects pecan producers and food processors alike.

Given that pecan consumption in China went from non-existent to millions of pounds in just 20 years, and given its importance as a market for U.S. pecans, it is worth exploring the state of pecan consumption in China. A pecan is not a generic commodity. Its attributes can vary considerably across pecan varieties and environmental conditions (Silva et al., 1995; Magnuson et al., 2016). This is known by consumers, who, in United States experiments, are shown to value pecans differently according to whether they are natives or improved varieties, the pecan size, and its country of origin (Palma, Collart, and Chammoun, 2014).

China is a peculiar pecan market, one of the few (along with Italy, Vietnam, and Mexico) to import more in-shell U.S. pecans than shelled U.S. pecans (FAS, 2020), and so the characteristics of Chinese pecan demand deserves special attention. To what extent are pecans a familiar food in different regions of China? How does pecan consumption compare to consumption of other nuts? What demographic factors are associated with higher pecan consumption? How do Chinese view the pecan in terms of healthfulness and other considerations? A better understanding of the China

market is important to preserving it, for there will be increasing competition for its consumers, both from other exporters and the growing China pecan industry (Zhu, 2018). We explore these questions through an internet survey of over 900 Chinese consumers.

Objectives

This is an exploratory survey, seeking to document the nature of pecan consumption in China to aid U.S. exporters in understanding their market. The main questions asked are as follows. How well can Chinese consumers identify pictures of pecans relative to other popular nuts? How does pecan consumption vary across demographic variables in China? How frequently do Chinese consumers eat pecans relative to other popular nuts? What are their general attitudes towards pecans in regard to healthfulness, how pecans are consumed, and other considerations?

A few terms have specific definitions and, thus, are worthy of stating explicitly here. Respondents—the first question of the survey asks whether the respondent is born and raised in China, and only those who answer yes are administered the survey. No attempt is made to verify citizenship, length of residence in China, or whether the person had traveled abroad. No data are collected on ethnic identity. Also, individuals above the age of 50 and below the age of 18 are excluded from the sample due to their low sample sizes, so the targeted 'respondents' only includes those between the age of 18 and 50. All respondents claim to be located in one of the mainland Chinese provinces and, thus, do not include residents of Hong Kong, Taiwan, or Macao.

Weighted statistic—the demographics of the sample are not identical to those of the China population. When a weighted statistic is employed that means the respondent's observation was assigned a weight generated by a sample balancing mechanism to force the sample to behave as if the distribution of their age (among those 18 to 50), region, household size, and gender is identical to that of mainland China, as reported by the 6th Chinese Demographic Census conducted in 2010.

Nut—there is a botanical and a culinary definition of a nut, and this research uses the culinary definition. Botanically, a nut is a seed which does not naturally detach itself from its shell, so the fruit and the seed remain attached. Peanuts are actually legumes, and cashews are seeds that have separated from the tree fruit, so these are not botanical nuts. Many foods referred to in a culinary sense as a nut are botanically something else. However, in this study a food is referred to as a nut whenever the common vernacular dictates.

The rest of the paper is organized as follows. The next section describes the survey instrument and is followed by a section describing the survey respondents. Then, a separate section showing the results of each objective is provided. The final section briefly summarizes the important findings for the U.S. pecan industry.

Survey Design

The survey instrument is divided into five parts (1) a nut identification test, (2) questions regarding the frequency of pecan and other nut consumption, (3) questions regarding how pecans are consumed, (4) questions about attitudes towards pecans, and (5) a set of demographic questions.

An example of the nut identification test is shown in Figure 2. The test was designed to assess how well respondents could identify almonds, hickory nuts, macadamia nuts, pecans, and walnuts from a picture. Figure 2 shows what the test looked like for in-shell pecans, and similar tests were conducted for the other nuts within the shell. A separate test is then given where the nuts are shelled. After being presented the picture, respondents were asked to select the name of the nut, where the options are almonds, hickory nuts, macadamia nuts, pecans, walnuts, and hazelnuts (hazelnuts were always an option, but never the correct answer).
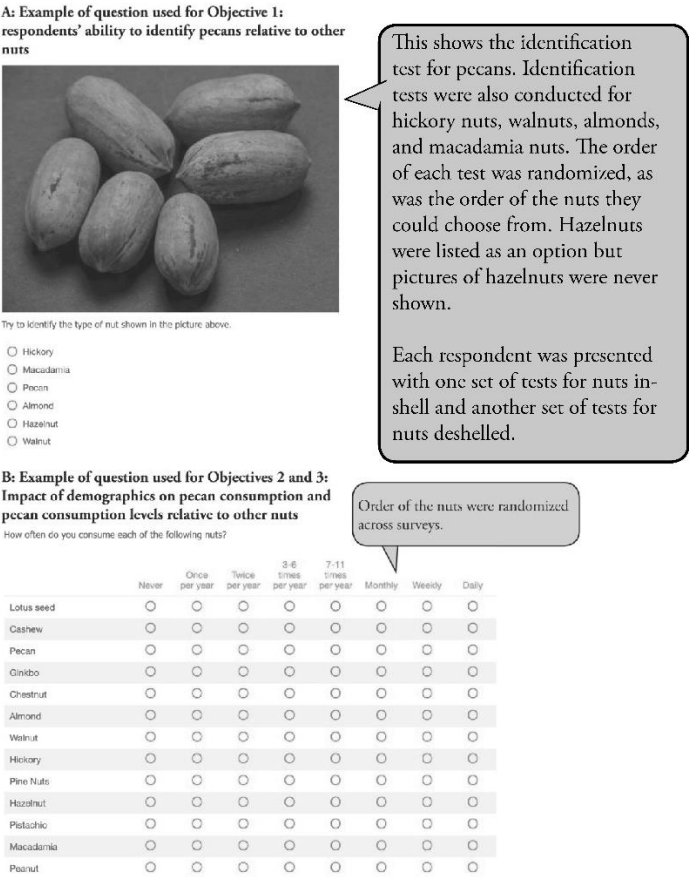

Figure 2. Illustration of Survey Questions as They Appeared on the Instrument.

Thus, the identification test contains 10 total questions, five for in-shell nuts and five for shelled nuts. Respondents are first presented the five questions for in-shell nuts and then the five questions for shelled nuts. Within each test, both the order of the nuts and the order of the possible answers are randomized. That is, when a respondent is presented with the identification test for in-shell nuts each nut has an equal probability of being shown first, second, third, fourth, or fifth. Also, the order in which the nut names appear as answers is randomized, such that each nut has a one-sixth chance of being shown first, second, third, fourth, fifth, or sixth. Note that the type of shelled nuts consumed in China are often different from those in the United States. The most popular varieties may be different and, in China, the shells are often cracked whereas, in the United States, this is rarely the case. To account for different possible pecan appearances, for the in-shell nuts, half the time the picture shows a typical un-cracked American pecan and half the time it shows a typical cracked Chinese pecan.

The second part of the survey concerns the frequency of nut consumption, both in an absolute sense and relative to other nuts. Respondents are asked how often they consume each of the following 13 nuts: pecan, almond, walnut, macadamia, hazelnut, hickory, cashew, pine nuts, pistachio, chestnut, ginkgo, lotus seed, and peanut. This list was intentionally expansive so that there would be many benchmarks by which to compare pecan consumption. Some, like pine nuts and peanuts, do not always compete for market share with pecans. For example, peanuts are often consumed in the form of peanut butter but there is no equivalent butter spread for pecans, and when individuals indicate their level of peanut consumption it is unclear whether they are including processed products like peanut better. The eight levels of consumption frequency are: "never," "once per year," "twice per year," "three to six times per year," "seven to eleven times per year," "monthly," "weekly," and "daily." Part B of Figure 2 shows the question used to elicit the frequency of pecan and other nuts' consumption. The order of the 13 nuts is randomized across surveys.

Pecans are frequently used as a recipe ingredient in the United States, such as pecan pie. It is not clear if pecans are used in this manner in China, or if they consume pecans exclusively as a direct snack. Thus, a survey question is provided eliciting this information, where we list five different forms of eating: raw and already shelled pecans; raw but not already shelled pecans; cooked, flavored, and shelled pecans; cooked and flavored but not shelled pecans; and a recipe or dish containing pecans. For each pecan type, respondents were given the statement, "When you consume pecans, you tend to eat them as," and they were asked to select the appropriate response. Response options are: "strongly disagree," "disagree," "somewhat disagree," "neither agree nor disagree," "somewhat agree," "agree," "strongly agree," and "I do not eat pecans."

Respondents' attitudes towards pecans could have effects on their preferences for and consumption of pecans. These attitudes are measured through a series of agree/disagree and true/false questions, eliciting the perceived relationship between pecans and weight loss, bone health, and other outcomes. A few questions also ask the respondent to compare pecans and walnuts in their healthiness, price, convenience, and the like. In all such questions, respondents are presented with either a positive or a negative statement. For instance, half are asked to answer true/false to the statement "Eating pecans is good for bone health," while the other half are presented with the statement "Eating pecans is bad for bone health." The combination of positive

and negative statements should produce responses that are free of bias from positive/negative statements, such as acquiescence bias, where individuals prefer to agree with statements.

The final section of the survey contains a series of demographic questions, including the respondents' age, gender, region, family income, household size, number of children, and educational background. These questions are needed both for the sample balancing algorithm and to evaluate how pecan consumption varies across demographic profiles.

Respondents

The survey was administered over six days in September 2017 in the Mandarin language, written by one of the authors, a Chinese native. The Survey Sampling International (SSI) company was responsible for recruiting respondents, using an opt-in panel where volunteers take surveys in return for rewards like airline miles, cash, gift certificates, and the like. While SSI can provide a representative sample in terms of some demographics like gender, and can provide respondents throughout all regions of China, the sample will not be truly representative as it does not employ probability sampling and relies only on opt-in panels. The company uses a quota procedure to select respondents, sending invitations to panelists in such a manner that it includes respondents covering many demographic categories and regions.

Table 1. Statistics of Internet Survey Sample Before Sample Balancing and the 6th Chinese Demographic Census.

Demographic	Internet survey sample before sample balancing (N=1000)	The 6th Chinese demographic census(2010)
Gender	*Percent of Sample*	*Percent of Population*
Male	51.00	51.19
Female	49.00	48.81
Age		
Under 18	0.30	20.93
18-30	41.50	21.73
31-40	34.90	16.78
41-50	16.50	16.29
51-65	6.00	16.03
Above 65	0.80	8.24
Highest Education		
Junior College degree	24.40	5.15
Graduate degree	6.80	0.31
Primary school diploma	0.10	26.80
Middle school diploma	1.00	38.88
High school diploma	7.40	14.00
Bachelor's degree	60.30	3.42
Household Size		
1 person	3.40	14.56
2 people	10.10	24.42
3 people	55.10	26.92
4 people	17.10	17.60
5 people	10.70	10.06
6 and above 6	3.60	6.43

The demographics of the sample compared to the population is shown in Table 1 and Figure 3. The gender profiles match closely. As is typical in surveys, the younger population is over-sampled, as are those with a higher education. As well, the sample contains considerably more

three-person households than the population. In regard to regions, the 29 provinces and autonomous regions of China are aggregated into six regions in Figure 3. The survey over-samples the eastern and northern regions, under-sampling other regions.
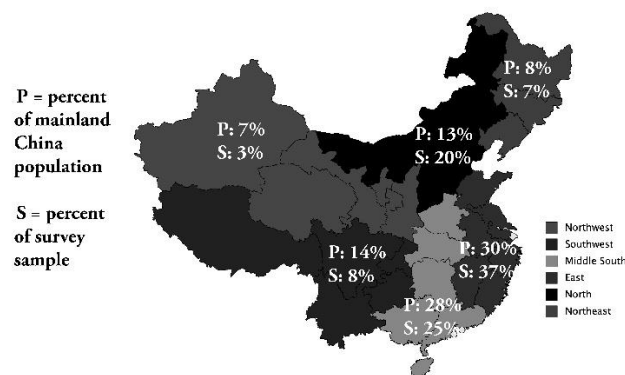

Figure 3. Percent of Survey Sample and Chinese Population in Six Regions.

As no respondents were supposed to be under the age of 18 and, given so few respondents above the age of 51, this study only includes the observations of those 18-50 years of age, reducing the sample size to 929. Otherwise, a sample balancing algorithm would assign a disproportionally large weight to the few people older than 50, and these large weights would increase the variance of statistics considerably. The sample balancing algorithm used by Lambert et al. (2014) is used to make the sample behave more like a representative sample. This algorithm calculates a weight for each observation, such that the demographic profile of the sample mimics the population in terms of gender, age distributions in the 18-50 category, region, and household size. For example, while only 3% of the sample resides in the northwest region, the weighted percent of respondents residing in the northwest region is 7%, identical to the population percentage. After these weights are calculated, they are "trimmed" such that the maximum (minimum) weight is no more (less) than the 95th (5th) percentile. All statistics reported as a "weighted" statistic are computed using sample balancing.

Results

Objective 1 Results

The first objective was to assess the extent to which Chinese consumers can recognize pecans from pictures. Table 2 shows the percentage of respondents who identify each nut correctly. Approximately 60% of respondents correctly identified the in-shell pecan, indicating it is a familiar nut in China. This percentage differs little depending on whether it is a picture of the pecan as they often appear in the United States or as they often appear in China. Though more than half of respondents could not properly identify the pecan, they tended to perform just as well or better identifying other nuts in-shell. Walnuts are the most recognizable nut, but this is not surprising given their unique appearance and widespread appeal in China.

Table 2. Results of Nut Identification Test.

Nut Type	Percent of sample correctly identifying nut	
	In-shell	*Shelled*
Pecan	57-60[a]	43
Hickory	63	58
Almond	70	88
Macadamia	58	56
Walnut	95	87

Notes: Respondents are shown pictures of the nuts in a random order and are asked to select the correct nut from a list of the following six nuts: pecan, hickory, almond, macadamia, walnut, and hazelnut. Results are from 929 respondents from China between 18 and 65 years of age. Percentages are calculated using weights acquired from a sample balancing algorithm. a 57% using picture of typical pecans in the United States and 60% using picture of cracked pecan taken from a Chinese retailer.

    The ability of respondents to identify the pecan drops considerably when viewing them shelled. Less than half could identify the pecan absent its shell. This might be due to the fact that the pecan and hickory nut resemble each other without their shells, so respondents were perhaps confused by the two nuts, especially since hickory nuts are popular in China. Walnuts are still highly recognizable without the shell, and the percent who could identify the almond rises when the almond is shelled.

    What do these results imply? Since there are only six options, they should be able to identify the nut correctly 1/6 of the time if they choose randomly. Yet most nuts are identified roughly 50% of the time or more, indicating Chinese are familiar with the five nuts. Perhaps the most important result is that pecans are much more recognizable within the shell, suggesting that is how Chinese typically purchase pecans. However, Figure 4 (discussed shortly) suggests they purchase pecans in-shell about as much as they purchase pecans without the shell, so there remains ambiguity as to the form of pecans most widely purchased in China.
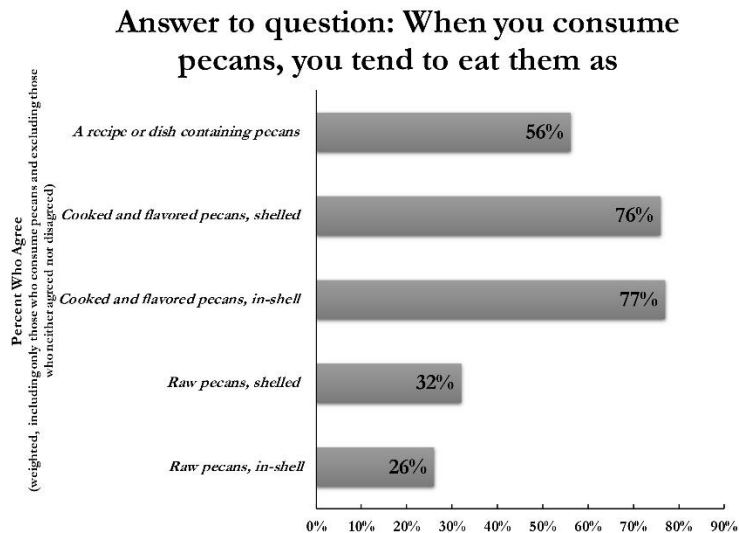
Answer to question: When you consume pecans, you tend to eat them as

Notes: Respondents are asked whether they agree with each statement on a 1 to 7 scale (1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree). They are said to "agree" if the scale value is greater than 4, so 26% provided an answer of 5, 6, or 7 to the statement that they eat pecans raw and in-shell. Percentages above are weighted statistics using weights from a sample balancing algorithm.

Figure 4. How Pecans Are Consumed.

Objective 2 Results

To better understand consumers of U.S. pecan exports in China, variations in pecan consumption levels are studied by demographics. Recall that respondents indicate their level of average pecan consumption by indicating 1 = never, 2 = once per year, …, and 8 = daily. As this is a discrete variable where a larger number indicates greater consumption, it is used as the dependent variable in an ordered logit regression. Explanatory variables include gender, age, education, family income, household size, number of children, and region. The ordered logit estimates are shown in Table 3.

There are no detectable variations in pecan consumption across the six regions, suggesting that, despite its enormous size, pecans have reached every part of China and have similar levels of per-person consumption across regions. This is perhaps surprising, given the large amount of pecans that enter China from its eastern shores, and the short period of time in which pecans have been available. It may be that the Chinese infrastructure allows for inexpensive transportation and that its inter-regional cultures can adopt new foods at similar rates.

Females tend to consume more pecans than males, and the young consume more than their older counterparts. Pecans are generally considered a more expensive nut, so it is not surprising that higher income levels lead to higher consumption rates, verifying the claim by Wells (2014) that rising pecan consumption in China is due to its growing middle class. Education is correlated with higher consumption also, but that might be partially due to the positive correlation between

education and income (note, the reverse could be said as well). Households with one child consume more than households with more than one child or no child, and household size seems to have no influence on consumption.

Table 3. Ordered Logit Estimates for Frequency of Pecan Consumption.

Indicator Variable	Ordered Logit Coefficients	Standard Error
Gender		
Female	0.4227*	0.1206
Age		
Age 31-40	-0.4040*	0.1403
Age 41-50	-0.5262*	0.1843
Education		
bachelor and above bachelor's degree	0.7521*	0.1362
Family income		
30,000 yuan < a ≤ 100,000 yuan	0.4085*	0.1956
Above 100,000 yuan	0.8270*	0.1999
Household Size		
3 or 4 people	-0.1190	0.2168
5 and above 5	-0.2782	0.2740
Number of children		
1 child	0.7687*	0.1682
2 and 2 more children	0.3312	0.2484
Region		
Northeast China	-0.1364	0.2703
East China and	0.1545	0.1654
Middle-of-south China	-0.1248	0.1777
Southwest China	0.0680	0.2413
Northwest	-0.0692	0.4036

*Notes: Dependent variable is the stated level of pecan consumption, where 1 = never, 2 = once per year, ..., and 8 = daily (see Figure 3). All variables in the table are indicator variables, so the '3 or 4 people' variable equals one for household sizes of 3 or four people and zero otherwise. Indicator variables for 18-30 years of age, not having a bachelor's degree, income less than 30,000, household size of 2 or less, having no children, and being in the northwest region are excluded to make the model tractable. Threshold parameters for the ordered logit models are not shown. * denotes statistical significance at the 5% level.*

   Overall, these results suggest that the popularity of pecans has crossed regional borders but not certain cultural borders. The young, educated, and wealthy consume more pecans than their counterparts; the young are expected to maintain their consumption as they age, to be replaced by a new generation that also consumes pecans. Moreover, education and wealth levels are expected to rise, so all indications suggest that pecans will become even more popular in the future.

   This is in addition to the popularity they have already received; about half of the respondents (using weighted statistics) said they consume pecans three or more times each year, and 35% said they consume pecans at least once a month. For an understanding of how large the demographic impacts can be, consider the difference in consumption across genders, where 17% of males indicate they never consume pecans, compared to only 8% of females.

Objective 3 Results

It was previously reported that about half of the Chinese respondents consume pecans three or more times per year, but how does that compare to other nuts? Recall that respondents are asked not only about their pecan consumption, but consumption of many other nuts, including lotus seeds, cashews, chestnuts, hazelnuts, and peanuts. To evaluate the level of pecan consumption compared to 12 other nuts, an ordered logit model is used where the dependent variable is the level of consumption (1 = never, 2 = once per year, …, and 8 = daily) and the explanatory variables are indicator variables for the type of nut. Estimation results are shown in Table 4.

Table 4. Weighted Ordered Logit Estimates for Frequency of Nut Consumption.

Indicator Variable	Ordered Logit Coefficients	Standard Error
Ginkgo	-2.546	0.1305
Macadamia	-2.143	0.1280
Pecans	-2.105	0.1329
Hazelnuts	-1.981	0.1305
Pine nuts	-1.919	0.1198
Lotus seed	-1.915	0.1213
Hickory	-1.843	0.1269
Cashews	-1.683	0.1202
Pistachios	-1.451	0.1191
Chestnuts	-1.447	0.1170
Almonds	-1.415	0.1189
Walnuts	-0.527	0.1365
Peanuts	0	-----

Notes: Dependent variable is the stated level of nut consumption, where 1 = never, 2 = once per year, …, and 8 = daily (see Figure 2). The variable pecan equals one if the nut being considered is a pecan and zero otherwise. All parameters were statistically significant at the 5% level. The weights used are those from a sample balancing algorithm. The coefficient for peanuts is normalized to zero for model identification. Threshold parameters are not shown.

The most frequently consumed nut is the peanut, and the ginkgo seed is the least frequently consumed. The list of nuts in order of highest to lowest consumption are

1. Peanuts (highest consumption)
2. Walnuts
3. Almonds
4. Chestnuts
5. Pistachios
6. Cashews
7. Hickory Nuts
8. Lotus Seeds
9. Pine Nuts

10. Hazelnuts
11. Pecans
12. Macadamia Nuts
13. Ginkgo Seeds (lowest consumption)

Although previous results suggested that pecans are regularly consumed all across China, these results show that pecans are far from being the most popular nut. Hypothesis tests show that macadamia nuts, hazelnuts, pine nuts, hickory nuts, and lotus seeds all have consumption levels that do not differ significantly from pecans. ginkgo seeds are consumed less frequently, and all the other nuts are consumed more frequently.

What is preventing pecans from rising to among some of the most popular nuts? This can be partially assessed by investigating how pecans are used and some general attitudes towards pecans. Thus, we move to Objective 4.

Objective 4 Results

The fourth objective concerned some general attitudes and beliefs about pecans, both in an absolute sense and in relation to other nuts. First consider a previously mentioned result that pecans rank relatively low in relation to other nuts in terms of consumption. Then consider the answers to a variety of questions shown in Figures 4-7. Figure 4 provides a variety of insights, one being that the respondents say they prefer pecans to be cooked and flavored. Raw pecans are less popular. There seems little difference in their preference for the pecans being in-shell or shelled, and more than half indicated they use pecans as a dish or recipe.


Answer to question: I believe that pecans...
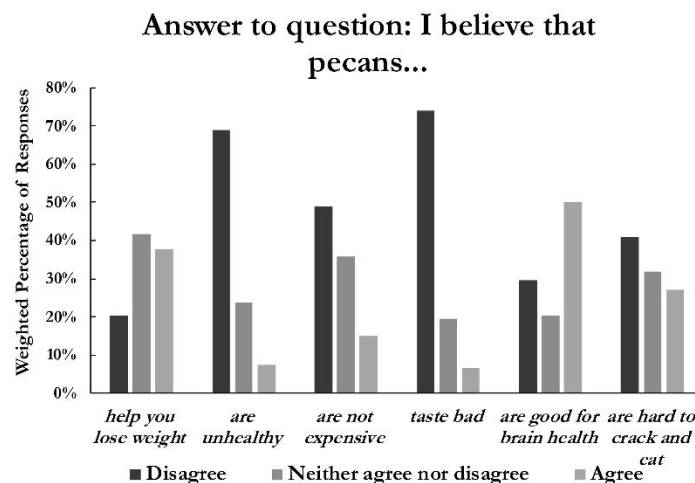
Notes: Respondents are asked whether pecans or walnuts are superior in terms of each trait, so more than 60% said pecans were superior to walnuts in terms of weight loss. Percentages above are weighted statistics using weights from a sample balancing algorithm.

Figure 5. Attitudes Towards Pecans as Compared to Walnuts.

The previous section demonstrated that walnuts are one of the most popular nuts in China, so it is helpful to consider how they view the attributes of pecans relative to walnuts. As Figure 5 shows, consumers generally said pecans have a better taste, are easier to crack and eat, and are better for losing weight. Most said that walnuts cost less money and are better for brain and physical health. Pecans and walnuts, then, may not be close substitutes for one another, and pecans are considered more of a luxury nut, where a higher price must be paid, but for a better taste.

While walnuts may be considered more healthy, pecans are still considered healthy in an absolute sense, as over 70% of the respondents disagree with the statement that pecans are unhealthy (Figure 6). When given a variety of ways in which pecans could improve health (Figure 7), more people said it was good for that health trait than bad, except for preventing hair loss, where the result was about even.
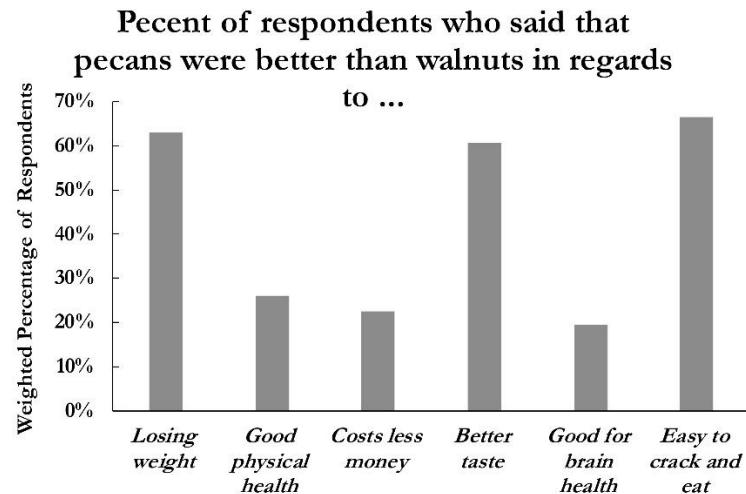

Notes: Respondents are asked whether they agree with each statement on a 1 to 7 scale (1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree). They are said to "agree" if the scale value is greater than 4 and disagree if less than 4, so 20% provided an answer of 1, 2, or 3 to the statement that they believe pecans help you lose weight. Percentages above are weighted statistics using weights from a sample balancing algorithm.

Figure 6. Attitudes Towards Pecans.

It is commonly said that the appearance of a food is particularly important to Chinese consumers. Walnuts are said to be good for brain health because the nut's appearance looks like a brain, and it

is believed that whatever body part a ginseng root resembles, that is the part of the body it will help. The actual shape and size of a pecan can differ across varieties. To investigate how shape and size impact anticipated taste, consider Figure 8. Here respondents were shown two pecans of the same total size, but one was tall and skinny while the other was short and fat. A strong majority of the respondents believe the tall and skinny pecan would taste better. Most also believe that a large pecan will taste better than a small pecan with the same shape. It is unclear why this would be the case, but it should be noted that appearance has often been mentioned to not only impact the anticipated taste of food, but the actual reported taste (Spence, 2017). So pecans that are taller and skinnier may sell better in China than their fatter and shorter counterparts.

True or False? Eating Pecans …
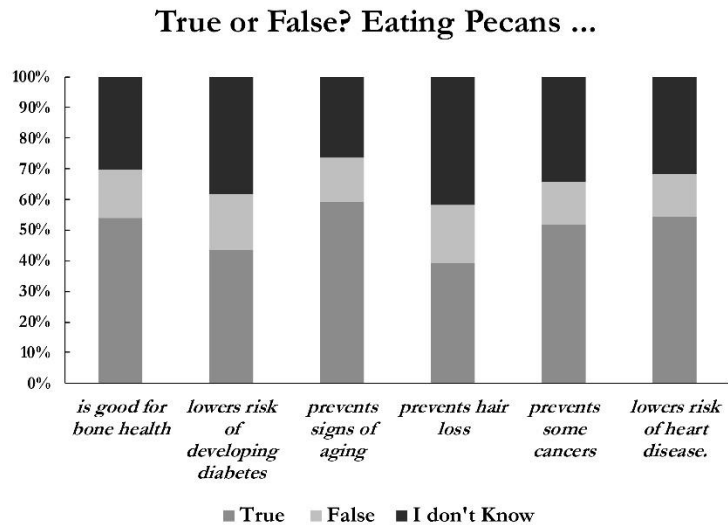
Notes: Respondents are given three choices for each statement: "true," "false," or "I don't know.".
Percentages above are weighted statistics using weights from a sample balancing algorithm.

Figure 7. Beliefs About Pecans and Health.
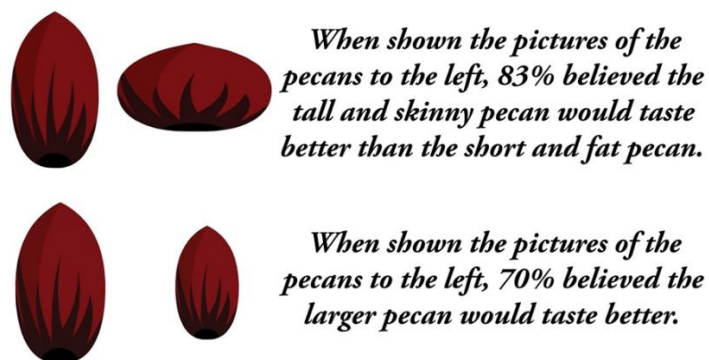
Notes: Percentages above are weighted statistics using weights from a sample balancing algorithm.
Figure 8. Relationship Between Pecan Shape and Size and Its Anticipated Taste.

Implications for the Pecan Industry

This survey was conducted with the intention of helping the U.S. pecan industry better understand an important export market—China. So what did we learn? A few highlights are as follows.

First, pecan consumption is roughly the same across regions in China, so producers should not expect greater exports to result from better access to regional markets in China. Second, the young, educated, and wealthy consume pecans at a higher rate, so one would expect pecan consumption in China to rise over time. Third, while half of respondents consume pecans at least three times a year, suggesting pecans have found a home in the Chinese diet, pecan consumption is considerably lower than other nuts such as cashews, almonds, and especially walnuts. This is because pecans are thought to be a particularly expensive—though a better tasting—nut, at least compared to walnuts. Finally, Chinese consumers generally have a favorable opinion of pecans, believing them to be healthy and, unlike in the United States, China prefers the pecans to be cooked and flavored.

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