Fresh Potato and Meat Preferences by U.S. Region

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We develop an econometric model to identify factors that influence fresh-market demand for red, russet, Yukon, and organic potatoes. Explanatory variables include potato price, pork price, chicken price, steak price, consumer income, Body Mass Index, organic penetration rate, number of Whole Foods stores, and U.S. region. We find the strongest demand for organic and Yukon potatoes in New England, for russets in the East South Central region and for reds in the West North Central region. White meats were complements for Yukons and organics while red meats complemented russets and reds. Own-price elasticities ranged from −0.60 for reds to −1.50 for organic potatoes.

The traditional American diet of meat and potatoes is showing no signs of decline in the near future. U.S. meat consumption in 2015 is forecast to be just over 1/4 pound per person per day, while potato consumption is projected to be more than 1/8 pound per person per day (USDA ERS 2003). Given the stable consumption of both products, improved understanding of regional meat and potato preferences could help the potato industry segment the marketplace, identify appropriate products for particular destinations, and maximize results from targeted advertising.

Fresh Potato Demand

Fresh potato demand is influenced by price, income, prices of other goods, and consumer preferences. For consumers who wash, peel, and cook fresh potatoes, convenience may be an important aspect of consumer preferences. Some researchers have used convenience-related variables, such as women in the labor force and meals eaten away from home, in demand models (Guenthner, Levi, and Lin 1991). Another study tried to capture the influence of convenience by including microwave oven ownership in a fresh potato demand model (Guenthner, Lin, and Levi 1991). Health aspects of consumer preferences do not appear to have been analyzed in fresh potato demand studies.

The complementary relationship between meats and potatoes was confirmed by Davis et al. (2008) who used Nielson scanner data to estimate demand for meats, vegetables, grains, and potatoes. While they did distinguish among meat types, they did not include specific categories for potato types. The substitute relationship was investigated by Hsieh, Mitchell, and Steigert (2007), who analyzed demand interactions among four potato types—conventionally grown fresh, fresh organic, frozen processed, and dehydrated processed potatoes—during 2000–05. They found that a good substitute for a potato product is another potato product. Geographical differences in demand were explored by Shortridge and Shortridge (1989), who analyzed fresh fruit and vegetable consumption in major metropolitan areas. They concluded that regional variations in eating habits exist and that some regions are more willing to adopt new foods.

Consumers purchase potatoes based on traits such as appearance, texture, and flavor. Rinear (1931) found that "mealiness" was most important to consumers, followed by appearance, moisture content, and flavor. Decades later, consumers identified appearance, shape, and skin quality as very important fresh potato quality measures (McCracken and Marotz 1989; Cook et al. 2000; Jemison, Sexton, and Camire 2008). Consumers surveyed by Cheng et al. (1991) identified method of preparation as an important factor when deciding which type of fresh potato to purchase. Consumers liked russets for baking and round whites for their suitability for a variety of cooking methods.

Four Types of Potatoes

We analyze four types of potatoes in this study: russets, Yukons, reds, and organic potatoes. Russet potatoes, coined as the quintessential American potato, are distinguished by medium tan to dark brown dappled skin and white flesh (Fabricant 2001). Rus-

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sets are high in starch with a dry, mealy texture that turns light and fluffy when cooked. It is suggested that russets are best when prepared baked, mashed, or fried (Ochef n.d.).

Yellow potatoes, most popularly identified by the Yukon Gold variety, are distinguished by a smooth yellow skin and buttery flesh (Fabricant 2001). Also dense and creamy, Yukons are suitable for roasting, baking, mashing and frying (Ochef n.d.).

Red potatoes are distinguished by skin color. A smooth and waxy texture; thin, rosy skin; and snowy white flesh are characteristics of U.S. red potatoes (Fabricant 2001). Reds are most often used for soups, casseroles, potato salad, and roasting because they are high in sugar content and low in starch and because of their ability to hold their shape (Ochef n.d.).

Organic potatoes in this study were not restricted to a particular type, but only had to meet the USDA's labeling standards for "Certified Organic." Organic potatoes are distinguished from all other potatoes by the "Certified Organic" seal, which signals to consumers that they contain at least 95 percent organic ingredients (National Organic Program 2006).

Meat Types and Consumption Patterns

Red meat consumption per capita has been declining while poultry consumption has been increasing. Putnam and Allshouse (2001) attribute the shift in consumption to concerns about cholesterol, saturated fat, and lack of convenience in red meat preparation. Despite an overall trend toward more poultry, many other factors influence consumer preference for meat type. Price of competing meat products, holiday season, growth trends, nearness to payday, seasonality, advertising, and prior week's purchases were included in one model of retail meat demand (Capps 1989).

Dietary restrictions affiliated with religious beliefs also influence meat choices. The Roman Catholic faith abstains from meat consumption on Ash-Wednesday and on Fridays during Lent. Seventh Day Adventists practice a lacto-ovo vegetarian diet, meaning they eat milk and eggs but abstain from consumption of meat, fish, or poultry (White 2000). The Muslim faith does not consume pork. In the Jewish faith, neither pork nor shellfish are consumed (Pond, Nichols, and Brown 2009). The Hindu faith traditionally practices vegetarianism;

however, those who do not follow a vegetarian diet still avoid beef (Thakrar, Das, and Sheikh 2008).

Demographics and nutritional concerns are two other factors that influence meat preferences. Rimal (2002) found that those living the Northeastern and Western regions of the United States preferred more meatless meals and less red meat than do those living in the Midwest and South.

We did not find studies that analyzed regional differences in meat–potato pairing or differences in types of meats preferred by consumers of different types of potatoes.

Objectives

Our objectives were to build an econometric model of fresh potato demand, analyze differences in meat complements for four types of fresh potatoes, and analyze regional differences in fresh potato demand.

Theoretical Framework

Tomek and Robinson (1990) cited four factors as determinants of demand: population and its distribution by age, geographic area, etc.; consumer income and its distribution; prices and availability of other commodities and services; and consumer tastes and preferences.

Our model includes variables that represent all four demand shifters. Although population was not included as a stand-alone variable, it was incorporated by adjusting quantity of potatoes consumed to a per capita basis. The second demand shifter, consumer income, was also adjusted to a per capita basis to provide consistency and to include population's effect on the income variable. We hypothesized that all potato varieties are normal goods with respect to income.

The third demand shifter is represented by the price of each potato type. According to Pindyck and Rubinfeld (2005), "goods are substitutes when an increase in the price of one leads to an increase in the quantity demanded of the other." All four types of potatoes were considered substitutes for one another based on the notion that the best substitute for a particular type of potato is an alternative type of potato. We expected a positive coefficient sign on the retail price of each substitute potato type.

The third demand shifter is also represented by complement foods. Hirshey (1996) describes goods

that tend to be used together as complements, where a decrease in the price of one good results in an increase in quantity demanded of the other good. Retail price of beef steaks, center-cut bone-in pork chops, and whole chickens were selected as complementary meat products with potatoes. We anticipated different potato type choices for pairing with different meat types. We expected a negative coefficient for each meat complement variable, but anticipated varying degrees of statistical significance among potato types.

The fourth demand shifter, consumer tastes and preferences, is difficult to quantify yet is an important driver of demand. Guenthner, Lin and Levi (1991) measured the impacts of advertising on consumer preferences for potato products. Love et al. (2006) measured the impact of media attention to low-carbohydrate diets on consumer demand for orange juice. Rimal, Moon, and Balasubramanian (2006) used organic food consumption as a proxy for consumer perceptions regarding biotechnology. We chose three variables as proxies to depict consumer tastes and preferences regarding health issues.

First is the number of Whole Foods stores in each region. This was used to assess consumer preferences and availability of organic foods. We chose Whole Foods because it is the world's largest organic retailer. The number of Whole Foods stores would be expected to have a positive impact on organic potato demand. However, we hypothesized that the number of Whole Foods stores would not have a statistically significant relationship on the quantity of other potatoes consumed.

Second is the average Body Mass Index (BMI) in each region. We hypothesized a possible relationship between consumer body fat and potato type preference. According to the U.S. Centers for Disease Control (2007), "Body Mass Index is a reliable indicator of body fatness for people." Body Mass Index is calculated by "dividing weight in pounds by height in inches squared, and multiplying by a conversion factor of 703." The resulting calculation is then interpreted within a range of values corresponding to levels of body fatness, with high BMI values corresponding to high levels of body fat.

We selected BMI as a proxy for consumer preferences regarding healthiness associated with each potato type. While many consumers consider fresh potatoes a healthy food (Jemison et al. 2008) we

also sought a link between health perceptions and measures of health. Gilmore (1999) related Body Mass Index to a broad spectrum of health measures. His study examined BMI's correlation with thirteen chronic conditions in order to proxy overall health; indicators ranged from incidence of arthritis and urinary incontinence to high blood pressure and diabetes. Gilmore found that people with a high BMI had a high probability of reporting one or more chronic illnesses.

Saba and Messina (2003) found that consumers identified organic fruits and vegetables as "healthy, environmentally friendly, and more tasty and nutritious than conventionally grown food products." Due to the association of organic foods with healthiness, we anticipated a negative coefficient on the BMI variable. We expected that in regions where the BMI is low, organic potato consumption is high. We hypothesized a positive coefficient on BMI for russet potatoes, but were uncertain about the effects of BMI on red and Yukon potatoes.

The third taste and preferences variable is organic penetration rate, the ratio of organic food sales to total food sales. Since the organic penetration rate is a proxy measure of consumer preferences for organic foods, we expected a positive sign on the coefficient. We hypothesized that the organic potato market is so small it has little effect on conventional potatoes and anticipated a lack of statistical significance on the organic penetration rate coefficient for red, Yukon, and russet potato demand equations.

We hypothesized a relationship between regional culture and food choices. To quantify any differences, we used dummy variables to distinguish between the nine U.S. Census Bureau regions. We chose the New England region as the base; consequently, all other regions are measured relative to New England's potato demand. Either a positive or negative coefficient can be anticipated for the region variable depending on the region's demand relative to that of New England.

Methods

Model and Variable Specification

We used ordinary least squares (OLS) regressions in Shazam 9.0 software to build demand equations for four types of fresh potatoes in the United States. The hypothesized linear demand equation is

(1) $Q_i = f(P_i, I, P_c, BMI, Pen, WF, D_1, D_2, D_3, D_4,$
$\quad D_5, D_6, D_7, D_8,),$

where Q_i = quantity of fresh red, Yukon gold, russet, and organic potatoes (pounds/person); P_i = price of red, Yukon gold, russet and organic potatoes ($/pound); I = per capita personal income ($1000/person); P_c = retail price of whole chickens, steak, and pork ($/pound); *BMI* = Body Mass Index (average per region); *Pen* = organic penetration rate (U.S. ratio of organic food sales to total food sales); *WF* = the number of Whole Foods stores (per region); D_1 = dummy variable for the Middle Atlantic region (NY, PA, NJ); D_2 = dummy variable for the East North Central region (WI, MI, IL, IN, OH); D_3 = dummy variable for the West North Central region (ND, SD, NE, KS, MO, IA, MN); D_4 = dummy variable for the West South Central region (OK, AR, TX, LA); D_5 = dummy variable for the South Atlantic region (WV, MD, DE, VA, NC, SC, GA, FL); D_6 = dummy variable for the East South Central region (MS, AL, KY, TN); D_7 = dummy variable for the Pacific region (WA, OR, CA, AK, HI); and D_8 = dummy variable for the Mountain region (ID, MT, WY NV, UT, CO, AZ, NM). Variables P_i, P_c, and I are deflated to 2002 dollars by the Bureau of Labor Statistics Consumer Price Index.

Data Collection

ACNielsen scanner data were obtained though the United States Potato Board (USPB) for each quarter in 2002 through 2007. The data track retail sales of bagged red, Yukon Gold, russet, and organic potatoes across the nine U.S. Census regions over 24 quarters, for a total of 216 observations. Only bagged potatoes were included; cartons or larger potatoes for bulk displays were not. The data include retail sales in grocery outlets but do not include sales in the food-service sector.

Total population estimates by state were obtained from the U.S. Census Bureau. Each state was aggregated into its respective region to obtain regional population estimates. Quarterly personal income estimates by state were obtained from the Bureau of Economic Analysis, aggregated by region, and adjusted to a per capita basis.

Retail price of whole chickens, beef steaks, and center-cut bone-in pork chops were obtained from the Bureau of Labor Statistics Monthly Consumer Price Index. A three-month simple average was used to calculate quarterly average prices per pound. Due to a lack of regional data, we assumed quarterly prices to be constant across each region.

The Body Mass Index (BMI) data were obtained from the United States Centers for Disease Control. Since BMI is a state-wide average measured on an annual basis, we used the annual rate as a proxy for the quarterly rate, aggregated by region, and assumed the annual rate to be constant for each of the four quarters in a year.

Organic penetration rate was obtained from the annual Organic Trade Association 2007 Manufacturer Survey. For this study the annual rate was used as a proxy for the quarterly rate and assumed to be constant for each of the four quarters in a year. Due to a lack of availability of organic food sales and total food sales on a state or regional basis we assumed the penetration rate to be constant across the U.S.

The number of Whole Foods stores was obtained on a state-by-state basis through analysis of Whole Foods Annual 10-K reports (Whole Foods Stores 2008), and then aggregated by region. The United States Securities and Exchange Commission (2008) requires that publicly held corporations file 10-K reports within 60 days of fiscal year end. Companies must disclose property holdings as part of the 10-K filing.

Results

The initial hypothesized demand equations were narrowed to incorporate only those explanatory variables that best explained demand for each potato type, creating four unique demand equations for each potato variety. A seemingly unrelated regression (SUR), or error-related regression equation, was then used in Shazam 9.0 to estimate demand for consumption of the four types of potatoes from the United States. Parameters of the estimated model for U.S. potato demand are presented in Table 1.

Individual R-squared values were 0.95 for red potatoes, 0.86 for russets, 0.83 for Yukons, and 0.90 for organic potatoes. A Durbin Watson test statistic for autocorrelation was computed for each of the four equations in the system. Results found no evidence to suggest autocorrelation exists in any of the estimated equations.

Table 1. Estimated Equations: Organic, Red, Russet, and Yukon Fresh Potatoes.

Variable	Organic	Red	Russet	Yukon
Intercept	0.0342	1.01	5.93	0.484
	(3.2)	(15.2)	(15.6)	(7.6)
Red price		-0.725	-2.07	
		(-4.9)	(-2.8)	
Yukon price	-0.0362		1.13	-0.440
	(-5.3)		(2.2)	(-10.2)
Russet price	0.0419	-0.695	-7.31	
	(3.9)	(-3.2)	(-6.0)	
Organic price	-0.0129	-0.0594		0.103
	(-5.4)	(-1.7)		(4.8)
Income	0.000001	0.000023		
	(2.2)	(5.4)		
Chicken	-0.0543			-0.347
	(-4.7)			(-2.8)
Steak		-0.157	-0.625	
		(-6.6)	(-6.1)	
Pork				-0.0468
				(-2.1)
BMI	-0.00067	-0.00818		
	(-2.8)	(-2.8)		
Organic penetration	0.605			4.59
	(3.3)			(9.1)
Whole Foods	0.00023	0.00268		0.00134
	(3.6)	(3.1)		(2.2)
Middle Atlantic	-0.0124	-0.0344	-0.367	-0.0849
	(-12.1)	(-2.3)	(-5.3)	(-11.6)
East North Central	-0.0103	*0.0139	0.153	-0.0821
	(-4.3)	(0.49)	(1.7)	(-9.8)
West North Central	-0.00732	0.267	*-0.0482	-0.145
	(-3.0)	(9.5)	(-0.46)	(-13.0)
West South Central	-0.0126	-0.107	*0.0271	-0.123
	(-4.1)	(-2.9)	(0.29)	(-13.9)
South Atlantic	-0.0150	*-0.0407	-0.413	-0.0876
	(-4.9)	(-1.06)	(-5.9)	(-6.8)
East South Central	*-0.00459	0.101	0.212	-0.127
	(-1.2)	(2.5)	(2.4)	(-10.1)
Pacific	-0.0113	-0.465	-0.982	-0.168
	(-4.8)	(-12.9)	(-6.3)	(-10.9)
Mountain	-0.00831	-0.225	*-0.0336	-0.137
	(-3.0)	(-8.0)	(-0.27)	(-16.1)
R^2	0.90	0.95	0.86	0.83

*Indicates a lack of statistical significance. A blank cell indicates that a variable was not included in the potato type specific equation.

Red Potato Demand

Fourteen explanatory variables were statistically significant in the red potato demand equation. As expected, the own-price coefficient was negative and the income coefficient was positive. The variables in the "other good" category showed that steak price was a statistically significant complement food with the expected negative sign. Neither white meat variable was statistically significant, suggesting that consumers who choose red potatoes eat them with beef.

We anticipated that the other three types of potatoes would all be substitutes, but negative coefficients on the prices of russet and organic potatoes suggest a complementary relationship. There was a lack of statistical significance for the price of Yukon potatoes.

An explanation for the negative coefficients involves the different attributes of reds and russets and their different cooking methods. Russets are mealy, fluffy, and starchy, and are most often served baked or fried. Reds are moist, more sugary than starchy, and served boiled, steamed, or roasted (Ochef n.d.). Due to differences in both preparation method and texture, consumers may be purchasing both red and russet potatoes in the same market basket, to be prepared in different meals.

The negative coefficient on organic potatoes could be explained by consumer adoption of new products. According to one study, only nine percent of consumers surveyed about frequency of organic use said they used organic products on a daily basis; 14 percent reported use on a weekly basis, six percent on a monthly basis, 44 percent on an occasional basis, and 27 percent said they never use organics (The Hartman Group 2007). The majority of consumers in the 2002–2007 period covered by the survey may have been trying to decide whether to adopt organic potatoes into their usual market basket of goods, but the lack of regularity associated with trial purchases explains the complement rather than substitute relationship.

We were surprised by the lack of statistical significance on the price of Yukon Gold potatoes. We expected Yukon Golds to be the closest substitute for red potatoes, due to their classification in the same category of specialty, or minor colored, potatoes. Perhaps consumers are not buying reds and Yukons together as complementary products,

and the varieties differ enough that they are not considered close substitutes.

In the "tastes and preferences" category, organic penetration variable was not statistically significant, supporting our hypothesis that organic potato sales are not taking away from conventional potato sales. The positive sign on the Whole Foods variable indicates that red potato consumption may increase along with organic preferences. The negative coefficient on the BMI variable suggests that consumers concerned about health may see reds as a healthy potato choice.

All but one regional dummy variable (East South Central) was statistically significant. The coefficient sign was positive for the West North Central and East South Central regions, indicating greater demand relative to the base region of New England. The negative for the other regions, indicates lower demand relative to New England.

Russet Potato Demand

The positive coefficient for Yukon Golds suggests that they are a substitute for russets. The Yukon is often described as all-purpose in terms of preparation methods, and as both dense and moist in texture. We infer that a Yukon is not different enough from a russet to be bought in tandem, or as a complement, but is close enough in its preparation methods that it could reasonably be substituted for a russet.

The negative coefficient for red potatoes suggests a complementary relationship, perhaps due to differences in both preparation methods and texture. There is symmetry in the complementary relationship between red and russet potatoes. There was a lack of statistical significance on the price of organic potatoes variable.

The lack of statistical significance for organic potatoes could be attributed to price differences between organic and russet potatoes. Of all potatoes considered in the model, organic potatoes are the most expensive and russets are the least expensive. Price difference alone could be enough to deter a consumer from substituting an organic potato for a russet potato.

Although we correctly hypothesized a positive coefficient for BMI, it was not statistically significant. We conclude that health perceptions regarding potato types, as measured through BMI, do not have a significant effect on consumption of russet

potatoes. This result is a direct contrast to health perceptions and body fat as they relate to consumption of organic potatoes.

Since Whole Foods stores cater to a higher-income clientele and have a core focus on organics, we anticipated no relationship between the number of Whole Foods stores and consumption of russet potatoes. The lack of statistical significance on the Whole Foods variable supports our hypothesis.

We found that income did not play a statistically significant role in the demand for bagged russet potatoes. As with red potatoes, the model shows steak as a complement for russet potatoes. Neither white-meat variable was statistically significant, suggesting that consumers who choose russet potatoes prefer to eat them with a red meat.

In both the red and russet potato demand equations we can see a similarity: red meat is the preferred complementary meat product. We also see that the organic penetration rate is not statistically significant for either potato type, suggesting that organic potato sales are not taking away from conventional potato sales.

Yukon Potato Demand

Results suggest that organic potatoes are a substitute for Yukon potatoes, but reds and russets are not. The lack of statistical significance for reds and russets may be explained in terms of different characteristics. While a russet buyer would consider substituting a Yukon potato, the Yukon purchaser may be less accepting of the mealy characteristics and the frying preparation methods common to russets. Yukon buyers may be averse to red potatoes because they are not starchy enough or not versatile enough in terms of preparation methods.

We attribute the substitutability of organics and Yukons to perceived health benefits. Brown (2005) suggests deep yellow to orange fleshed varieties of potatoes contain high levels of carotenoids that may act as antioxidants in the diet. If consumers are buying Yukons based on an association with antioxidant value as a perceived health benefit, then the health conscious Yukon consumer may substitute organics and Yukons on the basis of health perceptions.

In the Yukon potato equation we infer different relationships among potato and meat types. Unlike red and russet potatoes, where steak was the preferred complementary meat product, for Yukon

potatoes both white meats were statistically significant complements. Consumers who eat Yukon potatoes are most likely pairing them with a leaner white meat such as pork or chicken.

Among the "tastes and preferences" variables, organic penetration and Whole Foods were statistically significant with positive signs. This suggests that health-conscious consumers may regard Yukons as a healthy product. The lack of statistical significance on the BMI variable indicates that Body Mass Index is not a sufficient proxy for health preferences of Yukon Gold consumers.

The lack of statistical significance on the income variable suggests that income does not play a significant role in the demand for Yukon Gold potatoes. All seven regional dummy variables were statistically significant with negative signs. This indicates that consumers in the base region of New England have a strong regional preference for Yukon potatoes.

Organic Potato Demand

The positive, statistically-significant coefficient suggests that russet potatoes are a substitute for organic potatoes, even though organics were not a good substitute for russets. However, the price of Yukon potatoes carries a negative coefficient, suggesting a complementary relationship, which may be explained by Yukons being purchased at the same time as organic potatoes. Red potatoes were not statistically significant.

Chicken was the only statistically significant meat complement for organic potatoes. We can again infer different relationships among meat and potato type preferences. Chicken as the only complement meat suggests that an organic potato consumer prefers not just any white meat, but a particular white meat. This is a stricter dietary pattern than that of the Yukon potato consumer.

The three "tastes and preferences" variables were all statistically significant with the expected signs. Increases in the number of Whole Foods stores and the organic penetration rate can be expected to strengthen organic potato demand. Regions with high BMI would be expected to have lower consumption of organic potatoes as evidenced by the negative coefficient.

The positive sign on the income coefficient shows that organic potatoes are a normal good. All seven regional dummy variables had nega-

tive signs, suggesting that consumers in the base region of New England have a strong preference for organic potatoes.

Discussion

Elasticities

Elasticities at the means are shown in Table 2. Elasticity of demand with respect to own price for red, russet, and organic potatoes was inelastic, with values of −0.60, 0.65, and 0.75, respectively. Yukon potatoes were elastic, with a value of −1.50.

Income only played a statistically significant role in explaining demand for two types: red potatoes and organic potatoes. We see that red potatoes are almost unitary elastic with respect to income, while organic potatoes are highly elastic with respect to income.

When examining the relationship between meat and fresh potatoes, red potato consumers and russet potato consumers prefer steak as a complementary meat product. The price of steak has a slightly stronger effect on red potato consumption, with cross price elasticity of −1.08, than does the price of steak on russet potato consumption, with a cross-price elasticity of −0.76.

For Yukon potatoes, both pork and chicken showed a statistically significant complemen-

tary relationship. The magnitude of the cross price elasticity of chicken (−1.91) suggests a stronger relationship between Yukon potatoes and chicken than between Yukon potatoes and pork (−0.78).

With regard to organic potatoes, chicken was a statistically significant complement, with a cross-price elasticity of −4.17. The price of chicken has the strongest effect of the two white meats analyzed. We also notice a much stronger relationship between the price of white meat and complementary potato types, compared to the price of red meat and complementary potato types.

Regional Differences: New England

The regional dummy variables allow for observations regarding preference patterns of the four potato types. We searched for population demographic information that would shed light on differences specific among each top consuming region. In particular we were curious why the New England region had the strongest demand for two of the four types of potatoes.

According to the Pew Forum's U.S. Religious Landscape Survey (2008), where respondents self-reported religious identity, the New England region has a high percentage of Catholics. Massachusetts, Connecticut and Rhode Island reported 43 percent of adults identifying affiliation with

Table 2. Potato Demand Elasticities: Organic, Russet, Red, and Yukon Potatoes.

	Organic	Russet	Red	Yukon
Own price	-0.75	-0.65	-0.60	-1.50
Cross price (russet)	1.11		-0.35	
Cross price (red)		-0.30		
Cross price (Yukon)	-1.72	0.18		
Cross price (organic)			-0.07	0.43
Cross price (chicken)	-4.17			-1.91
Cross price (pork)				-0.79
Cross price (steak)		-0.76	-1.08	
Income	2.85		1.05	

Catholicism, while Vermont, New Hampshire, and Maine reported 29 percent of adults as Catholic (Pew Forum 2008).

New England also has a high concentration of college-educated people. Connecticut, Vermont, and New Hampshire reported greater than 30 percent of the population as having at least a bachelor's degree, with Massachusetts reporting 37 percent of its population over the age of 25 as having a bachelor's degree (U.S. Census Bureau 2007). Perhaps religious affiliation and education level both influence potato preferences, but additional analysis along those lines are beyond the scope of this study.

Regional Differences: East South Central Region

The East South Central region has the highest per capita consumption of russet potatoes and has a strong presence of the Evangelical Protestant faith. Tennessee reported 51 percent of adults being affiliated with Evangelical Protestants, while Kentucky and Alabama reported 49 percent and Mississippi 47 percent (Pew Forum 2008).

Racial demographics might also be a factor in potato preferences. The East South Central region has a higher percentage of African-Americans than do the other top potato-consuming regions. Mississippi's African-American population is estimated at 37 percent, while Alabama reported 26 percent, Tennessee 16 percent, and Kentucky just over seven percent (U.S. Census Bureau 2007).

Regional Differences: West North Central Region

The top consumer of red potatoes, the West North Central region is less strongly affiliated with a single faith. The predominant religions reported in this region were Mainline Protestant, Evangelical Protestant, and Catholic (Pew Forum 2008). Most states reported affiliation of each religion between 21 and 35 percent (Pew Forum 2008). The West North Central region also reports the highest percentage of married couple families with both husband and wife in the labor force: 60 percent for North Dakota, South Dakota, Minnesota, Nebraska, and Iowa (U.S. Census Bureau 2007).

West North Central consumers prefer red meat as a complement to red potatoes, whereas New England consumers prefer white meat with yellow and organic potatoes. This agrees with Rimal's (2002) findings that people in the Midwest prefer more red meat than do those in the Northeastern and Western regions. Rimal cited the Midwest's economic dependence on the beef industry as rationale for the preference.

Potato Concentration and Dispersion

We searched for other differences especially in the East North Central (Wisconsin, Illinois, Michigan, Indiana, and Ohio) and East South Central (Kentucky, Tennessee, Mississippi, and Alabama) regions. The East South Central region accounts for the largest consumption of russet potatoes and the second largest consumption of red, Yukon, and organic potatoes. These two regions combined account for the largest and second largest consumption of all four potato varieties analyzed, demonstrating the highest concentration of all types of bagged potatoes consumed in the U.S. (Figure 1).

We were particularly interested in the patterns of consumption illustrated in moving from the region of greatest consumption to the regions of least consumption for each potato type. Russet potatoes, red potatoes, and yellow potatoes all showed clustering among neighboring states in the top three consuming regions. For example, for russet potatoes the greatest consumption is in the East South Central region, with the second greatest consumption in the region just to the North, in the East North Central region, followed by a southerly pull to the West South Central region. We can infer that the top three consuming regions of bagged russet potatoes occur among neighboring states within the central section of the U.S. (Figure 2).

Red potatoes exhibit a similar pattern. The highest consumption occurs in the West North Central region and spreads south to the East South Central region, which has the second largest consumption, followed by a movement north to the East North Central region. Again we notice the same pattern of clustering, where movement among the top three consuming regions occurs in a distinct sector of neighboring states in the U.S. (Figure 3).

Yukon potatoes follow the same pattern with regard to clustering. The top market is in New England, followed by the East North Central region and the Middle Atlantic region, with consumption again clustering among bordering states in a distinctive sector of the United States (Figure 4).
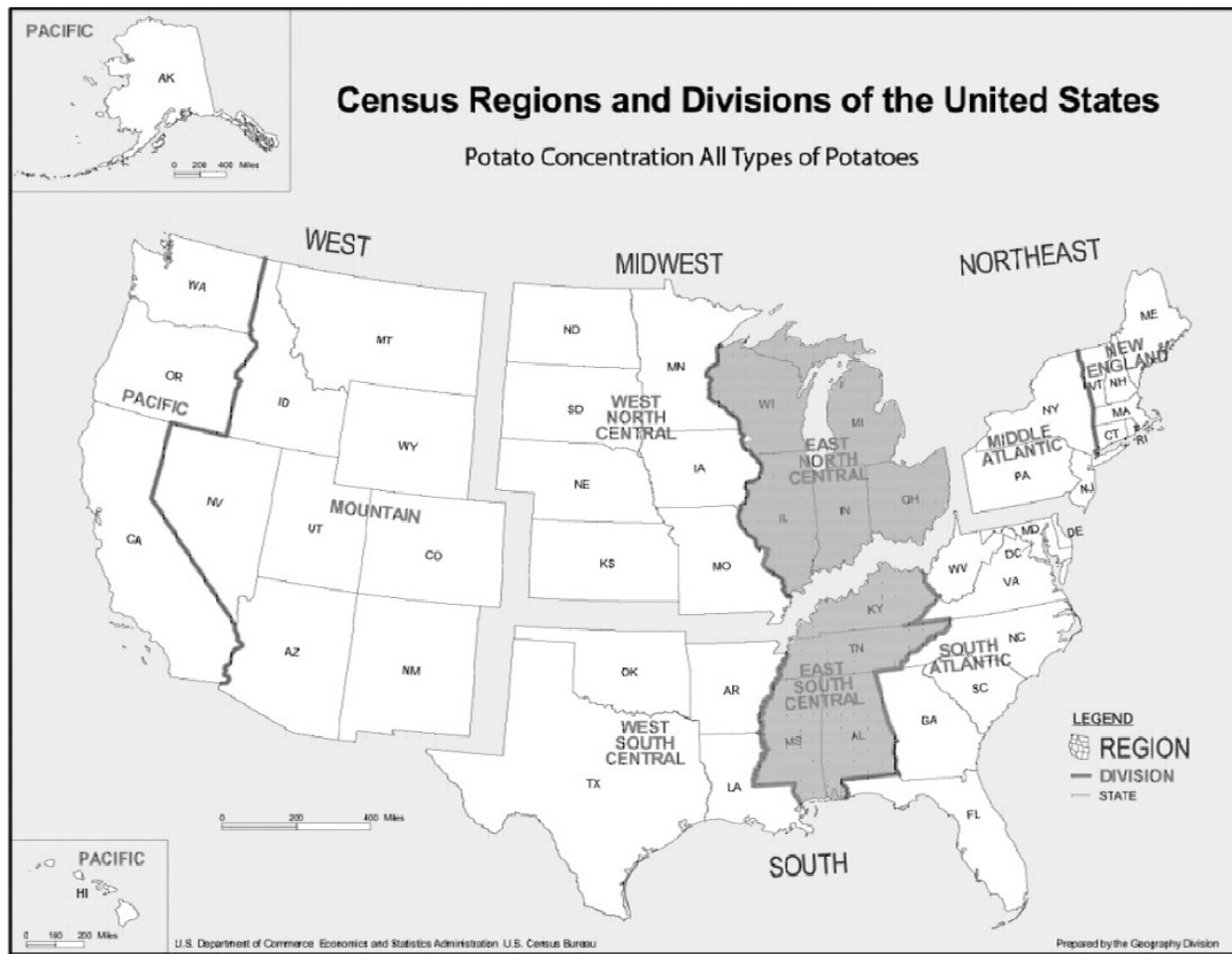
Figure 1. All Potato Type Concentration.

We considered the smallest amount of consumption by region and identified patterns. For red, Yukon, and russet potatoes, the Pacific region stood out, accounting for the least amount of consumption for all three potato types. There are several possible reasons why the Pacific region lags behind. It is possible that it is a low-consuming region for all types of potatoes. Another possible explanation is that Pacific region consumers prefer non-bagged bulk potatoes. California is also known as a hub for farmers markets and community supported agriculture (CSA), so a large portion of consumption may not be accounted for in retail scanner data.

Immigration patterns probably also contribute to differences in fresh potato demand. Future research might focus on predominant nationalities in each region.

Conclusions

Our objective was to better understand factors that affect regional demand for four types of potatoes in the U.S. Our model incorporated variables consistent with the four categories of demand shifters from economic theory. We wanted to better understand interaction among specific potato types and to focus on the traditional meat-and-potato relationship. There are four major findings to our study.

First, fresh potato type preference varies by region of the U.S. Consumers in the New England
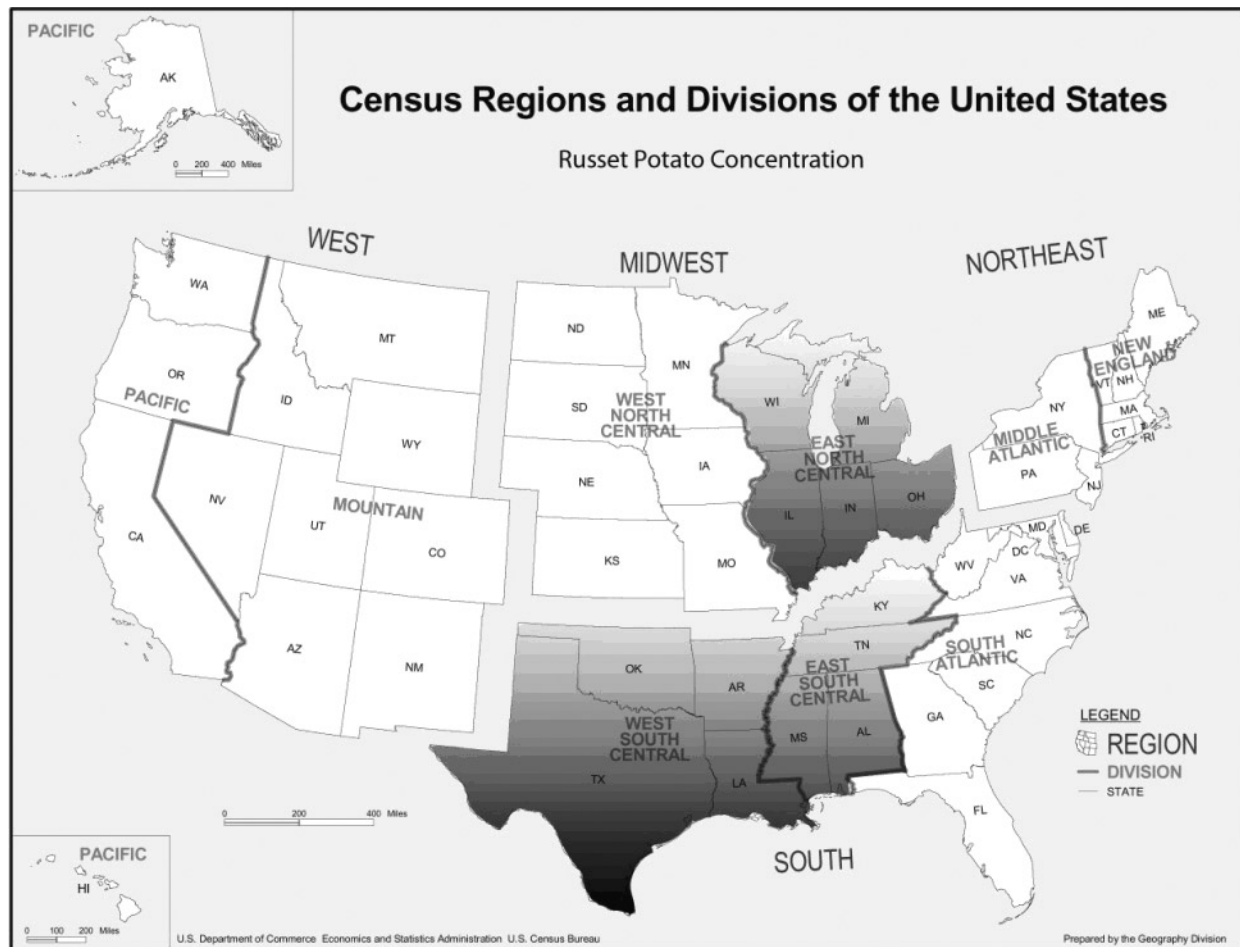
Figure 2. Russet Potato Concentration.

region prefer organic and yellow potatoes. The East South Central region prefers russets, and the West North Central region prefers red potatoes.

Second, consumers pair different meat types with different potato types. Red meat was a complement to red and russet potatoes, while white meat was a complement to Yukon and organic potatoes. We found a stronger relationship between the price of white meat and complementary potato types than between the price of red meat and complementary potato types.

Third, two U.S. regions that border each other stand out as having a high concentration of overall potato consumption. The East North Central and East South Central regions account for the largest and second largest consumption of all four potato types.

Lastly, red and organic potatoes are more responsive to changes in consumer income than are russet and Yukon potatoes. Consumers may be more sensitive to changes in price of organic potatoes because they are more expensive than other potato types, and to changes in price of red potatoes because they are less versatile in preparation methods.

Results of this study provide evidence of differences in potato demand by type, meat complement, and region. By better understanding consumer tastes and preferences on a regional basis, marketing efforts and product offerings can be targeted to best meet the needs of consumers.
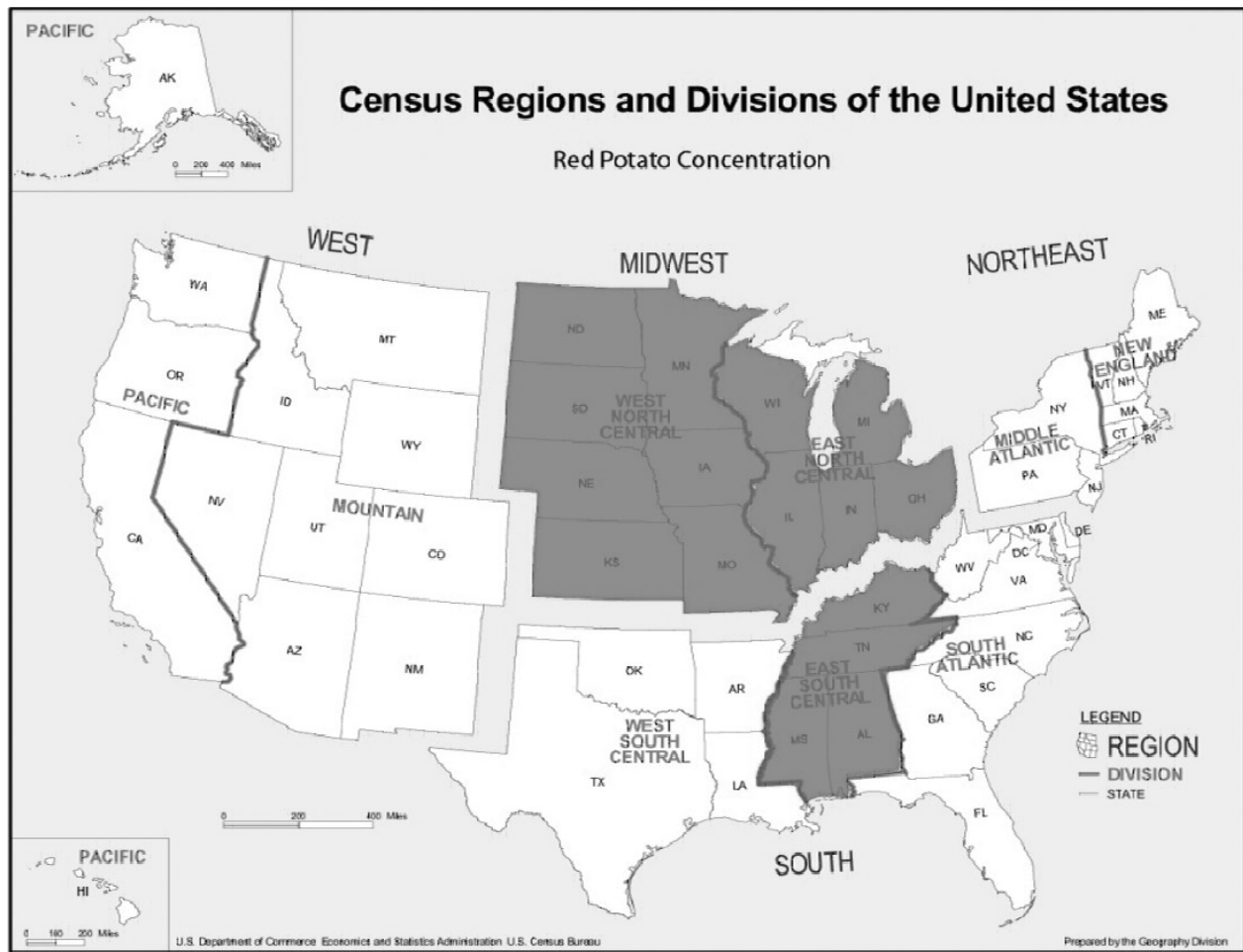
Figure 3. Red Potato Concentration.

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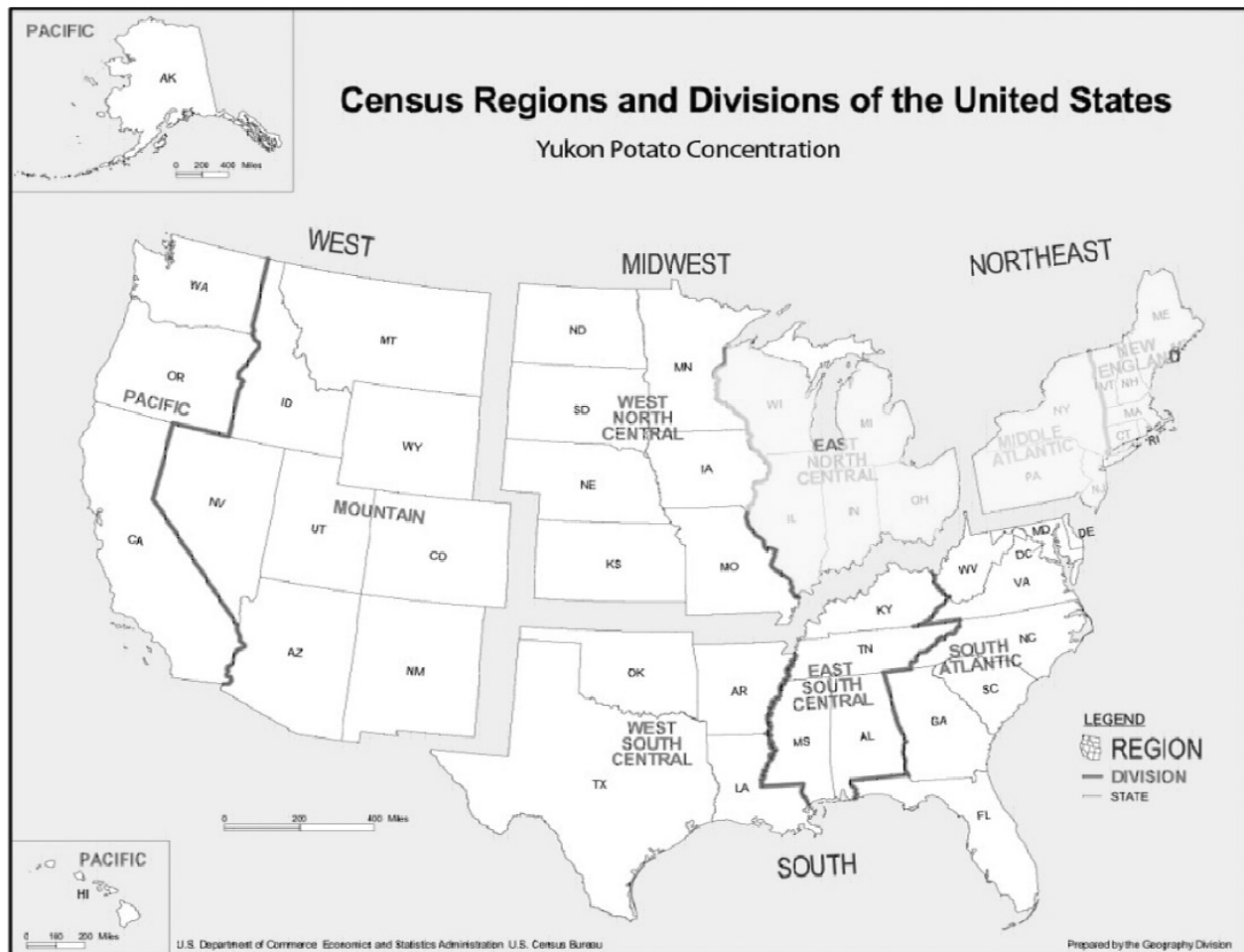
Figure 4. Yukon Potato Concentration.

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