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The impact of price on Potato consumption in the USA

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ABSTRACT

In this paper, we mainly use previous economic theory to test- if price increases, the demand of the goods declines automatically. As this theory is predominantly evident for all kinds of price and demand equation, this paper is not an exception. Using the US potato consumption data from 1970 till 2019, we show that when price increases, consumers tend to reduce their potato consumptions, even though potato is one of the main stable sources of carbohydrate for US population.

Keywords: Potato, Consumption, Price, Econometrical

1. INTRODUCTION

Potato consumption is very popular source of carbohydrate in the US and all over the world. Potatoes are consumed various form such as fresh, chips, frozen, dehydrated and so on where some unsold potatoes contribute to production for next season, including farm use for seed, feed, home use. There are 30 states currently producing potatoes for domestic consumption and exportation purpose. Among all the states, Idaho and Washington together produce more than half of the annual supply in the US. Idaho is the largest producer of potatoes in the US covering almost 30 percent of total production. Other potato grower states are Wisconsin, North Dakota, Oregon, Colorado, Minnesota, Michigan, California, etc.

According to a report published by USDA in September 2020, total potato production in 2019 was 424 million cwt which is a 2 percent decrease from the 2018. That report also reported that the market value of all potatoes is $3.94 billion, which is an 11 percent increase from 2018.

The year 1996 had the highest per capita potato consumption with 144.89 pounds and the lowest consumption was in 2016, with 110.21 pounds, during 1986-2019 time period. The average highest price was in 2016, with 77 cents per pound, and the lowest price was in 1986, with 26 cents per pound during that period. A study by Richards et al. (1997) shows that "although the carbohydrate consumption over the last twenty-five years has risen, fresh potato consumption has fallen by over 50%." WHAT CARBOHYDRATES INCREASED?

According to economics theory, price has a significant impact on the supply-demand balance and consumption. This paper is interested in the econometrical analysis of the impact of price on potato consumption in the USA. Our aim is to find out whether overall potato consumption in the US, not just individual type (human consumption, cattle feeds, seeds, etc.) of consumption. After analysis the data from year 1970 to 2019, our results suggests that when price increase the then the consumption of the potato reduce, regardless people want to eat more potato, as potato is one of the main sources of carbohydras in the US, also in the whole world.

Rest of the paper is organized in the following way: very next section explains the data collection method and the methodology of this paper. Section 3 demonstrate the graphical analysis of this research. In section 4 we show the empirical analysis of this research. Finally, section 5 we conclude our research.

2. DATA COLLECTION AND METHODOLOGY

Potato consumption data is available from the United States' National Potato Council, which is also available in the vegetables and pulses yearbook from the U.S. Department of Agriculture (USDA). That data can be accessed with ID APU0000712112 on the US Bureau of Labor Statistics website. This analysis has been done since 1986, with the latest data available from 2019. Potato price per pound can be accessed ID APU0100712112. This paper uses the average price per pound for each year. Despite knowing the fact that there are various varieties of potatoes in the USA, all of those have been assumed as homogenous for the simplicity of this study. Of course, price varies a lot depending on the geographical location in the US. For example, the price of a pound of fresh potatoes is lot cheaper in Idaho than New York. This research also assumes that USDA numbers are correct even though USDA annual totals do not equal the annual data broken down into categories and added. R-programing language has been used to design all the graphs and run regression.

For the regression analysis, a simple linear OLS estimator is used here, where the dependent variable Y_c is total potato consumption per capita (in pounds) and the independent variable X_p is the average price of potato per pound. μ_cp is our standard error.

$$Y_c = \beta_0 + \beta_1 X_p + \mu_{cp} \quad (1)$$

3. GRAPHICAL ANALYSIS OF POTATOES CONSUMPTION

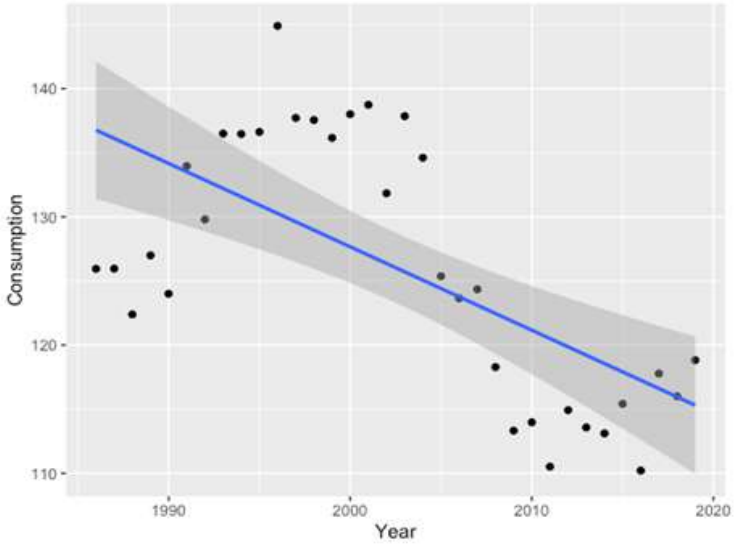

Figure 1: Total per capita potato consumption over time, 1986-2019

Figure 1 is clearly showing the consumption of potatoes has been drastically decreased over the years. In 1996 per capita potato consumption was the highest with 150 pounds. After that it continued to decrease until 2006. 2016 per capita potato consumption reduced to 110 pounds. All these results clearly show a decreasing trend in potato consumption over almost three decades.

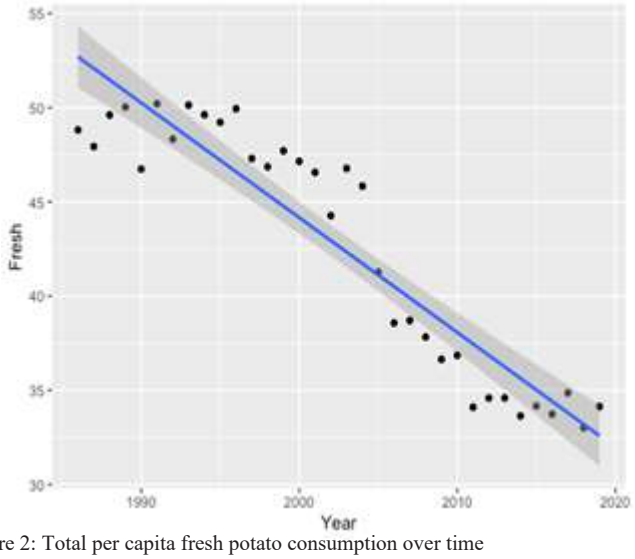

Figure 2: Total per capita fresh potato consumption over time

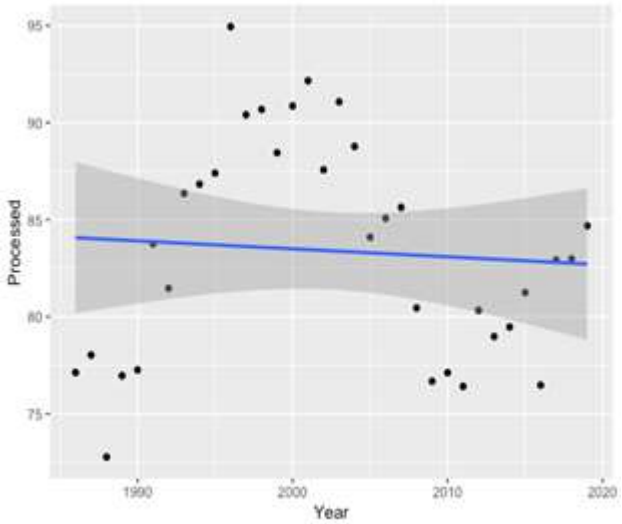

Figure 3: Total per capita processed potato consumption over time

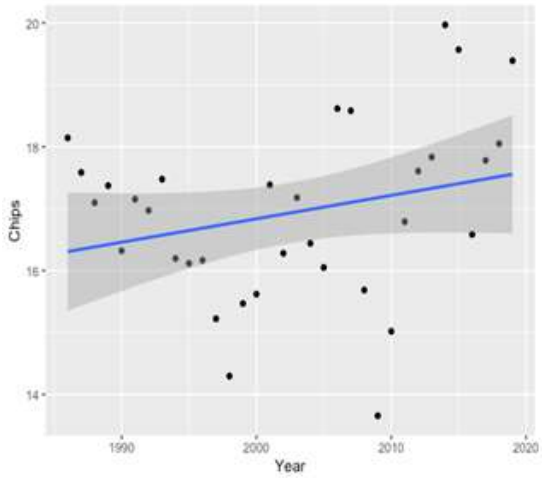

Figure 4: Total per capita potato chips consumption over time

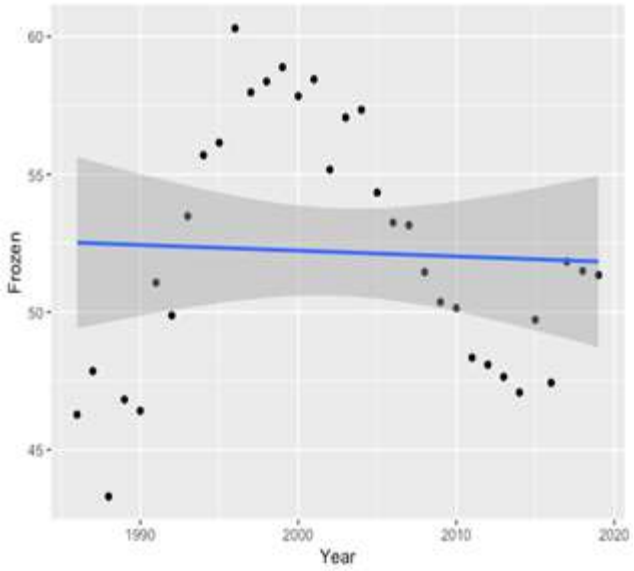

Figure 5: Total per capita frozen potato consumption over time

Figure 2 shows that fresh potato consumption has been drastically decreasing over time. A sharp decrease of fresh potato consumption happened from 2004 to 2006 followed by small changes since 1996. In 2017, the utilized amount was 33.4 pounds compared to 50 pounds in 1993, which is almost half the rate of 1993.

Figure 3 shows that processed potato consumption was not popular during late 1980s but gained popularity that started in the early 1990s to 2010. A peak for processed potatoes can be seen in 1996, which was an 8-pound increase from 87 to 95 pounds. On the contrary, consumption dropped in 2005, which was the beginning of annual decreases that hit a low of 76 pounds in 2011 following a slight increase in 2010. Finally, we can see an upward trend in recent years except for 2016.

In Figure 4, we see that annual consumption for potato chips varies widely from year to year, so much that it is difficult to imagine that only price fluctuations are driving potato chip consumption. There must be other factors at work, such as intense advertising campaigns and other marketing, advertising and promotional strategies used among competing potato chip companies and perhaps others. Still, the long-term average potato chip consumption per capita is increasing in the USA over the long-run for one or more reasons.

Figure 5 also presents a strange picture—an upside-down U-shaped pattern of data for frozen potato consumption since 1986 that would not appear to be random. While the long-term average is declining—probably due to negative perceptions about how healthy products such as frozen French fries, frozen hash browns, and frozen Tater Tots—there was that increase in per capita consumption almost every year from 1990 to 1999, and a decrease almost every year from 1999 to 2016. Consumer prices may also play a role in this, along with food companies' advertising and sales promotion strategies and tactics.

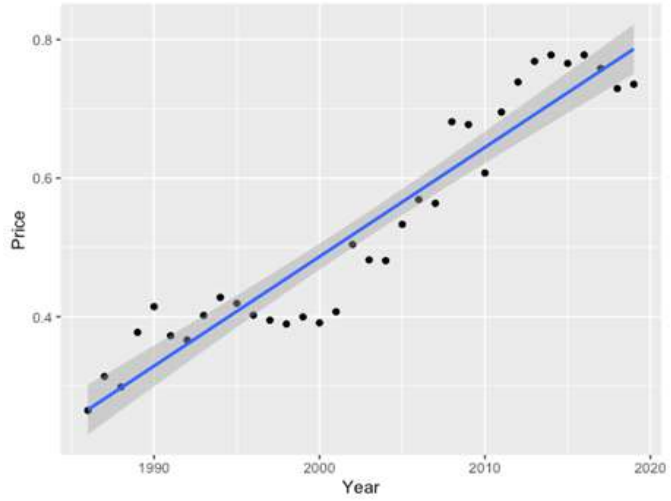

Figure 6: Per pound potato price in dollars over time, 1986-2019.

From figure 6 we can clearly observe the price of per pound potato price dramatically increase over the year because of positive relationship between price over time. It would be ideal and logical to show graphical analysis of individual types of potato's price changes over the year but because of data unavailability it did not happen.

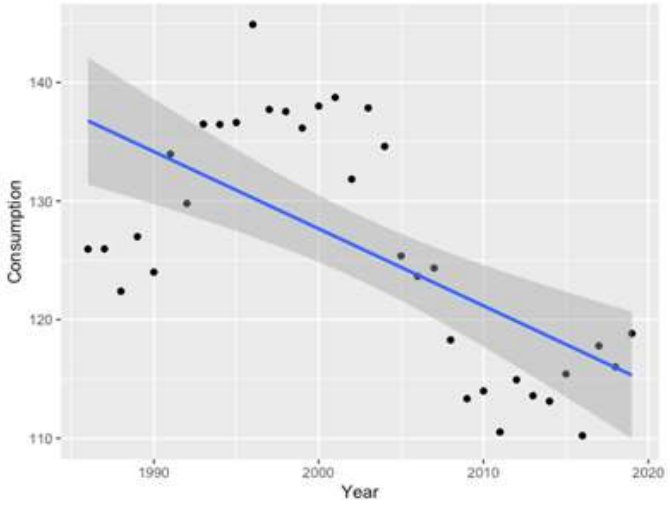

Figure 7: Total per capita potato consumption over time, 1986-2019

Figure 3 clearly indicates consumption of potatoes has been dramatically decreased over the year.

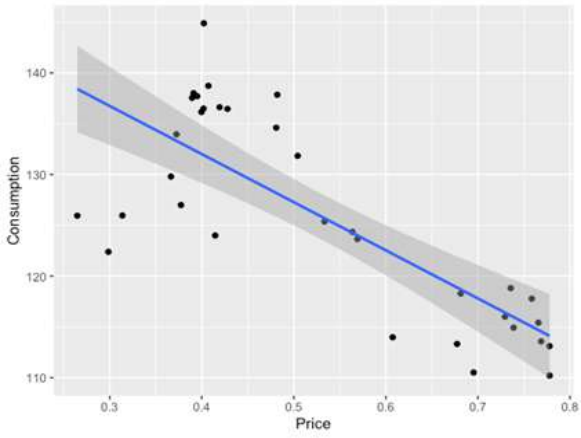

Figure 8: Average annual per capita total potato consumption (lbs) vs average price per pound.

4. EMPIRICAL ANALYSIS

Table 1: Descriptive statistics

Variables	Observations	Mean	Std. Div.	Min.	Max.
Consumption	34	126.039	10.075	110.212	144.889
Price	34	65.058	16.282	33.344	89.339

Note: Details descriptive statistics about potato consumption and price in the US.

From the table 1 we can see the details descriptive statistics of total potato consumption and price of the US from year 1970 to till 2019.

Table 2 Time series linear regression

Variables	*Model-1*
Constant (β_0)	151.9697***
t- statistic	27.11
Standard error	5.60627
Price (β_1)	-0.39858***
t- statistic	-4.76
Standard error	(0.08367)
R^2	41.49%
N	34

Note: This table shows the time series regression model of the US potato consumption. In here β_0 is constant and β_1 is total price of the potato. *, ** and *** represent the significant level 10%, 5% and 1% respectively.

In table 2 we can see that if price increase then potato consumption will reduce. Price (β_1) = -0.39858 and the standard error is 0.08367. From table 2 we can also see that our constant is positive and statistically significant at 1% level. Our R2 value is 41.49% and we have only 34 observations as our data are yearly data. If we look at our data and above figures, then should accept our null hypothesis and reject the alternative hypothesis. Because, our null hypothesis is, if potato price increase, then potato consumption will decrease.

5. CONCLUSION

From the data analysis it confirms that if everything holds constant and only price is the determinant then potato consumption is decreasing over time. Although this paper does not use adjusted inflation rate for average price for per pound potato. Price and consumption relationship is particularly important for the potato producer to know how much they will grow for next season.

There are many limitations of this paper. There could be involved many important factors such as substitution products, socioeconomic, demographic, taste, role of gender and many others. During a pandemic like COVID-19 the crops production hamper and no exception for potato production. So, the statistical analysis for pandemic time period will be much more different than usual time. Time constrains and more categorical data are unavailable at this moment. There would be further research of this topic using multiple regression which could give more statically significant result when more time and data will be available.

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