

MARKET TRENDS AND CONSUMER DEMAND FOR FRESH BERRIES

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Abstract: We present an analysis of markets for fresh strawberries, blueberries, blackberries and raspberries in the United States during 2008–2011. We use weekly panel data covering supermarket purchases in 52 cities. The primary goal is to estimate demand elasticities for fresh berries and thereby provide a better understanding of consumer behaviour in response to price changes and the nature of competition among these crops. We estimate fixed and random effects models for double log demand equations and a complete demand system, the Almost Ideal Demand System. The latter specification can be used to estimate demand relationships that conform to utility maximising behaviour. The elasticity estimates are very robust across the different specifications and estimation methods. This increases confidence in our findings and provides some assurance that choice of functional form or estimation method is not driving our results. We find that retail demands for all berry crops are in the elastic range and that the different berries are substitutes for one another. The demand for strawberries was the least elastic with an own price elasticity of -1.26 and blackberries were the most elastic with a demand elasticity of -1.88 . Blackberry demand was also the most responsive to the prices of competing berry crops. The study provides clearer insight into markets for berries in the United States. In addition, it fills a gap in the present lack of up-to-date consumer demand elasticities for these crops and will be useful for growers, decision makers and consumers.

Key words: berry crops, demand analysis, retail food markets

1. Introduction

In recent years, consumption of fresh berries has increased (Monson, 2009). At present, fresh berries are available in retail stores all year long and are sourced from different regions of the United States or the world depending on growing seasons (Lin *et al.*, 2003). One factor that has contributed to the growth in markets for fresh berries is the recognition that berries are high in desirable phytochemicals that may promote human health and protect against disease (Cook, 2011). Cardiovascular diseases, cancer and obesity currently kill more people every year than any other cause of death. Fruit and vegetables are an important component of a healthy diet and, if consumed daily in a sufficient amount, could help to prevent these major diseases (FAO and WHO, 2004). The

link between consumption and health provides promotion opportunities to fruit and vegetable producers (Lucier *et al.*, 2006). Fresh berry producers in particular have used positive health attributes to promote increased consumption. The benefits of consuming berries have been widely diffused by generic promotion programs supported by grower assessments (Cook, 2011). Berries are considered to be high-valued speciality crops. This means that producers of berries are capable of earning higher returns per unit of land than could be achieved in more traditional agricultural products.

Figure 1 shows the trend in berry consumption as seen in the retail market sample used in this study. The increase in volume over this short time span is striking. The figure also shows the relative sizes of the different berries we consider in this study. Fresh strawberries are by far the most consumed

fresh berry by volume. Fresh blueberries represent the next largest retail market by volume. Blueberries have become more popular due to very strong promotion of the positive health attributes of the fruit (Yang, 2008). Fresh blackberries and raspberries are much smaller by volume but have also experienced a very rapid growth in demand.

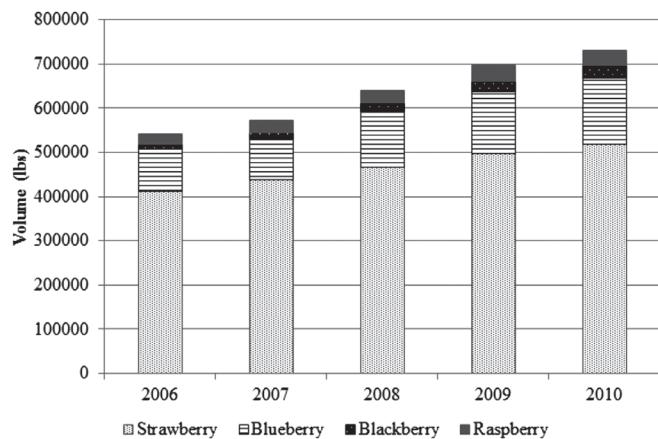


Figure 1. Total volume of berries in the U.S., 2006–2010

Due to the growing importance of retail fresh berry markets, there is a need to understand the demand relationships among these crops. This will provide a better understanding

of consumer behaviour and will facilitate grower-led efforts to promote their products. In this study, we estimate the own price elasticity of demand for each type of berry, cross price elasticities of demand between the different berries, and expenditure elasticities, in an effort to understand demand conditions in the U.S. berry markets. Before presenting this analysis, it is useful to provide some general background on price and quantity relationships in these markets.

Figure 2 shows that fresh berries are highly seasonal fruits and their price and quantity fluctuate through the season. The peak season for strawberries in the U.S. is from April to July, when consumption is at its highest point and prices are at their lowest points. In comparison to the other fresh market berries, strawberries have the longest peak season. Fresh blueberry prices show the most fluctuation over the season. Retail blueberry prices are at a high when volume is at seasonal lows and vice versa. The blueberry season starts around July and lasts into late August and the beginning of September. At the end of the year (November, December) there is almost no supply of blueberries. The blackberry season starts in May and lasts until late summer. The raspberry season starts slightly later, around June, and runs until the end of August. Blackberries and raspberries also show an inverse relationship between prices and volume at retail. However, these berries tend to command relatively high prices throughout the year.

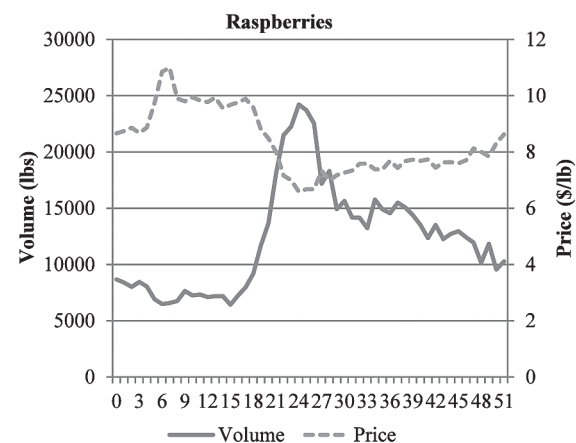
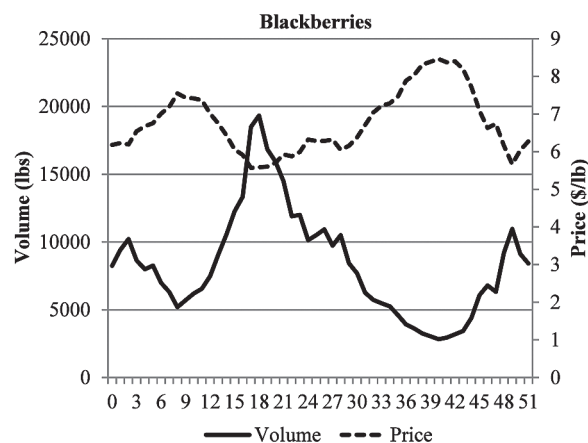
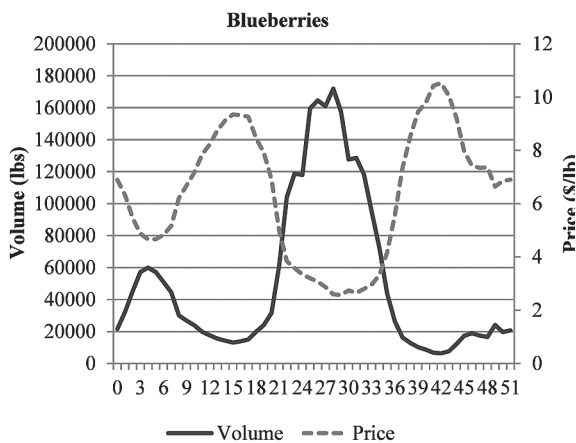
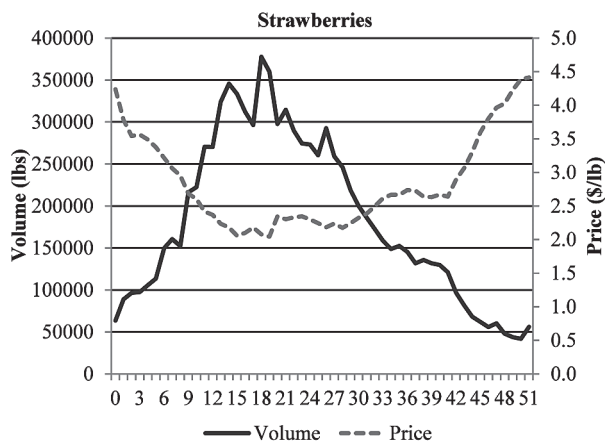


Figure 2. Average volume and price of strawberries, blueberries, blackberries and raspberries in the U.S. by week for 2008–2011

2. Methods

In this study we used weekly data covering 52 U.S. geographic markets from the 1st of March 2008 until the 19th of February 2011. Our dataset contains information on the volume and prices of berries being sold through retail supermarkets. Volumes are reported in pounds per market per week. Prices were reported by retail package size and vendor and so were converted to dollars per pound using the weight of the retail package being sold. These data were then used to estimate demand elasticities using two modelling approaches. The first approach involved estimation of double-logarithmic demand models using two-way fixed and random effects models. The second approach involved estimation of the Almost Ideal Demand System (AIDS) (Deaton and Muellbauer, 1980). Specifically, we estimate the linear approximate AIDS model. This has been commonly used among demand researchers. The model can be estimated with restrictions that are consistent with utility maximisation subject to a budget constraint, and with further restrictions that allow aggregation across consumers (Green and Alston, 1990; Thompson, 2004). Both Marshallian and Hicksian elasticities can be obtained from estimates of the AIDS model. According to consumer theory, the Hicksian demand functions are derived by minimising a consumer's expenditures and show quantity demanded as a function of prices and a given level of utility. On the other hand, the Marshallian demands are derived by maximising the utility and show quantity demanded as a function of prices and income (USDA ERS, 2009).

3. Results

Tables 1 and 2 provide the Marshallian and Hicksian elasticity estimates, respectively.

Table 1. Marshallian elasticities of U.S. demand for fresh berries

Demand for	Price of				
	Strawberry	Blueberry	Blackberry	Raspberry	Expenditure
Strawberry	-1.25610	0.12293	0.05347	0.07970	1.02250
Blueberry	0.32354	-1.49164	0.06401	0.10410	0.99654
Blackberry	0.52144	0.23716	-1.88447	0.12587	0.99959
Raspberry	0.39930	0.19818	0.64670	-1.66215	0.99811

Table 2. Hicksian elasticities of U.S. demand for fresh berries

Demand for	Price of			
	Strawberry	Blueberry	Blackberry	Raspberry
Strawberry	-0.66498	0.92289	0.52041	0.65419
Blueberry	0.89965	-0.71199	0.51910	0.66400
Blackberry	1.09931	1.0192	-1.42799	0.68749
Raspberry	0.97632	0.97906	0.52047	-1.10136

The Marshallian price elasticities reported in Table 1 are very similar in magnitude to those found in the double-log demand specifications. Consequently, only the elasticity estimates from the AIDS model are reported. The Marshallian elasticities in Table 1 show that retail demand for each kind of berry is own-price elastic. This finding is not unexpected. In a supermarket setting, there are typically many fresh fruits for sale which can serve as substitutes for berries to one degree or another. The easy access to substitutes for berries is likely to be one reason why demand is own-price elastic. Among the four types of berries, the retail demand for strawberries is the least responsive to the price with an elasticity of -1.26. Strawberries are a stable berry crop which have had a long presence in the retail produce departments. Consumers can reasonably expect to find strawberries available all year around and so they are likely to be a planned purchase item on consumer shopping lists. This is likely to be one reason why they are less own-price elastic than some of the other types of berries. Blackberries, on the other hand, are the most responsive to changes in own price with an own-price elasticity of -1.88. Blackberries are a relatively new crop on the market and are likely to be driven by impulse purchases in the supermarket. The own price elasticities for raspberries and blueberries are -1.66 and -1.49, respectively.

Cross-price elasticities of demand are positive indicating that the berries are substitutes for one another. In the double log models (not reported), nearly all of the cross-price elasticities are statistically significant at the 1% level. Some of the cross price elasticities show stronger substitution than others. As shown in Table 1, the price of blackberries has a relatively minor impact on the demand for strawberries, blueberries and raspberries. However, the demand for blackberries is influenced heavily by the prices of competing berry crops, especially strawberries and blueberries. Again, this is consistent with blackberries being an impulse item in the supermarket and reflects a substitution switch when consumers find higher prices for strawberries and blueberries. The Hicksian own-price elasticities (Table 2) are lower than Marshallian elasticities. However, this is expected because the Hicksian elasticities represent substitution effects after having compensated consumers for the income effect of the price change. The Hicksian elasticities also show the larger substitution effects that occur after compensating consumers for income effects.

Finally, all of the expenditure elasticities in Table 1 are positive. The expenditure elasticity for strawberry is 1.023 while blueberries, blackberries and raspberries are 0.997, 1.000, and 0.998, respectively. These results demonstrate that consumers would increase their consumption of each berry in nearly equal proportion to increases in expenditure on berries as a group. This finding is consistent with data presented in Figure 1, showing the growth in fresh-market volume for each kind of berry over the past few years.

4. Conclusion and discussion

The objective of the study was to estimate demand elasticities for four berry crops in the United States:

strawberries, blueberries, blackberries and raspberries. These berry markets are growing and so there is a need to understand their basic demand conditions. One key finding is that the demand for each type of berry is quite responsive to price. This means that there will be considerable volume growth in demand if berry prices fall as the result of improvements in production methods or due to increased efficiency in the farm-to-retail supply chain. For emerging markets like fresh blackberries and raspberries, such gains are likely as the industry expands and so we can expect fresh market volume to continue to increase over the next several years.

There is also a need to understand how these different fresh-market berries are competing with one another in the retail marketplace. We present strong evidence that the berry crops are substitutes in demand. Blackberries are especially sensitive to changes in the prices of competing berry crops and this is probably the result of their fairly recent emergence as a year-round supermarket item. Strawberries and blueberries are less responsive to changes in substitute prices. These substitution relationships are important for growers and marketers because they point to the spillover effects that can be expected as growers promote the health benefits or fund efforts to improve production efficiencies. For example, our findings indicate that promotion efforts for strawberries and blueberries are likely to be having positive spillover effects on blackberry and raspberry demand.

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