

## **Response to Out of Stock Produce and its Underlying Economic Considerations**

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## **Abstract**

The goal of this research is to investigate consumer response to out-of-stock product in the produce category. We do this by comparing results from a survey conducted in Greece and the United States to previous research on consumer response to out-of-stock situations for other perishable and non-perishable products. We further examined the underlying economic reasoning as well as the cultural and physical differences between the United States and Greece as explanations of different reactions. Out of Stock produce response proved different in produce than in other perishables and non-perishables. There is some evidence that produce does follow previous the suggested economic reasoning from the previous research, especially within transaction costs. Finally, the respondent's country proved very significant in dictating response.

## **Introduction**

When consumers go to a store, they may face a situation where the product they intended to purchase is out of stock (OOS). Gruen et al (2002) found that the global average rate of OOS was 8.3%. In response, consumers may react in different ways, from purchasing an alternative product (substituting), delaying the purchase, canceling the purchase, or going to another store to replace the product, or to replace all shopping. Each response carries a different consequence to the consumer, retailer, manufacturer, and competitors. Campo et al. (2000) tried to explain consumer response to OOS situations using economic principles to study the consumer's response to the situation and how these principles are affected by the nature of the product category and the personal characteristics of individuals.

The goal of this research is to determine the consumer's reaction to OOS situations within fresh produce and compare this to results found in other studies for other perishable and non-perishable goods. A secondary objective is to determine if the previous economic modeling of OOS response applies to produce. Finally, this study was conducted in both the United States and Greece; therefore we will investigate the impact of culture on this decision also.

### *Out of Stock Responses*

According to previous research (Campo et al 2000) opportunity costs, substitution costs, and transaction costs are the primary factors that affect consumer response. Consumer response varies per product because different products incur different out of stock costs. These costs then influence a consumer's specific and alternate responses.

In the context of OOS products, opportunity cost is the importance of timeliness of not consuming the desired product (Gruen et al 2002; Campo et al 2000). When the opportunity cost of a product increases, substitution or purchasing at another store also increases. However, as opportunity cost falls, delay or cancellation increases. The use of a produce dictates its opportunity costs. For example, an apple required for a recipe to bake an apple pie is considered a high opportunity cost OOS situation. Consequentially, a consumer is likely to obtain the product by either store or apple-type substitution. On the other hand, apples used as snacks do not have the same opportunity cost for replacement as the cooking apple.

Substitution cost is the cost associated with purchasing a different product to replace the OOS produce and is related to utility lost from product or brand substitution as related to *Item Loyalty* (Campo et al 2000). There are not many opportunities to substitute a different brand when shopping for produce like there are with other non-perishables found in the grocery store due to the often limited number of suppliers or lack of brand identification. For example, OOS banana substitution is not possible. This relates to the *availability of acceptable alternative items* (Campo et al 2000). It is important to recognize that the previous literature establishing a need for substituting for separate brands or quantities cannot effectively apply to produce. Substitution within produce is, therefore, difficult since multiple sizes or brands are rarely offered. Overall, this means that substitutes are limited per store. Of equal importance to substitution is *Specific Store Loyalty*, which increases the cost of purchasing the OOS item at a substitute store. A consumer may perceive higher quality for particular stores, even if both stores sold the same brand produce.

Transaction costs is the time or effort to purchase later or elsewhere as associated with the inherent cost of time/convenience to travel to another store or come back to the same store at a later time. Campo et al (2003) describe these as search costs, handling costs, and transportation costs. Distance and mobility have the greatest impact on transportation (Campo et al 2000, 226; Corstjens and Corstjens 1995).

### *OOS Response to Perishables*

To date, the only study that has considered consumer response to perishables that are out of stock is Van Woensel et al (2007). Their study considered consumer reaction to out of stock bakery bread. Across 3 Dutch stores, 84% of OOS bread responses were to substitute, dissimilar to previous findings in Europe, which show substitution (brand or quantity) for non-perishables as the most common response around 50% (Gruen et al. 2002; Emmelhainz and Emmelhainz 1991; Zinszer and Lesser 1981). Produce has many of the same characteristics as bakery bread. According to Van Donselaar et al 2006, some major perishable differences include high-average daily sales per item, shelf life, weekly sales, and average time between refill and level of store inventory.

Perishables often require additional intelligence for ordering the product because of need for prior knowledge and so are often ordered manually (Van Woensel et al 2007), while non-perishables are replenished through an automated store ordering system. Moreover, fresh bakery bread and fruits and vegetables do not have the same consistency as manufactured products. Fresh bread is subject to small amounts of random variation, while produce is subject to even more variation since there is less mechanical process that goes into its production. Consequentially, produce must be observed very closely for quality control.

Shelf life is important to consider in quality control. Fresh bread has a shelf life of one day, which means replacing all products every day. Produce's shelf life is often longer than a single day, but instead of daily replacement it is examined and culled for quality before it is on the sales floor. For non-perishables, the ability to stockpile the product is highly prevalent and can lead to high levels of purchase

delay (Sloot et al 2005). Opportunity costs of products with short shelf lives are much greater than non-perishable products.

The substitution of produce is predicted to be significantly different from bread and non-perishables. Bread is a necessity of many food baskets, making substitution likely; the many varieties of bread also make substitution plausible. Produce is not easily substituted since there are fewer similar replacement products. We predict that the substitution rate for produce to be significantly lower compared to other studies.

### *Greece and the United States*

Our study tests the underlying economic considerations across two countries, the United States and Greece. In the Gruen and Corsten study, US consumers were very brand loyal. Greek consumers would be a subset of overall European results, which indicated that Europeans were much less brand loyal (2002). As a whole, Europeans were less likely to switch stores when faced with an OOS situation (Gruen & Corsten 2002). However, some data do exist specific to Greek consumers. Greek consumers value the quality of products at a given store as the most important, followed secondly by specific quality of the individual product (Baltas and Papastathopoulou 2003). Greek grocery stores are relatively close to one another as well as centrally located, but location is still an important factor for Greek consumers.

The importance of OOS produce response relates to customer patronage. The produce departments are crucial in the judgment of a store (Kerin, Jain, and Howard 1992). This ties into store image, a reason for selecting particular stores and ultimately profit margins. It represents 12.7% of total store sales is the second most profitable category (Berner 1999). Thus, grocery store managers can more fully understanding the impact of out of stock produce OOS on customer decisions, and accordingly adjust their strategies and decisions.

### **Data**

In-person interviews were conducted in Greek grocery stores using convenience sampling (n=262) in the spring of 2009. Interviews were conducted with respondents in proximity to the produce

section of a grocery retailer in a metropolitan area of Northern Greece. In both Greece and the United States, all respondents were age 18 or older. US data was collected using both the in-person format (n=50) and online (n=258) in the summer of 2009. In-person interviews in the US were also conducted using convenience sampling with customers near the produce section. Online surveys were conducted with a market research firm to obtain a representative sample of primary grocery shoppers. Combining the dataset creates a total of 544 observations to study.

### *Dependent Variable*

The dependent variable in this study is the respondent's answer choice to the question, "When the fruits and vegetables you want to buy are out of stock, what is your most frequent response?" Respondents could select "Delay Purchase, Cancel Purchase, Visit another store for all of my shopping, visit another store for the specific product which is out of stock, buy substitute" or could write in their own response. As explained in the question, these responses were not based on actual OOS situations but, rather, hypothetical situations. Due to lack of response, three choices: the free response option; cancel purchase; and visit another store for all items; were not analyzed.

Since there is no way to justify an ascending ordinal value of the different response options, three separate regressions were constructed for each of the three response choices of interest: delay purchase (DELAY), go to another store for the OOS produce (STOREOOS), and substitute the OOS produce (SUB). Each dependent variable analyzed using probit regression where 1 equates to the particular response choice of interest and 0 represents all other response choices.

The data from each country were combined to create a clearer picture of the underlying economic considerations for each respondent. As such, the impact of each variable reflects the magnitude for both countries. Even though the relative importance of economic considerations can vary between countries, they operate in the same way. So, the conjoined data can be interpreted with a variable that distinguishes between both countries and shows the difference in OOS produce response.

### *Independent Variables*

Independent variables included a group of variables about the respondent's grocery store preferences. These variables included: ease of access, number of stores, store loyalty, quality, and shopping frequency. Ease of access, rated on a 5-point scale, indicated how important access to the store was in selecting what store to shop at. Access is related to the perceived transaction cost of going to the preferred and, at times, most convenient store. If an item is OOS, it would mean added time and effort spent trying to get an OOS item from another less convenient store, therefore, respondents how rate ease of access as more important are expected to have a greater likelihood to remain at the same store. Number of stores was the respondents answer to the question, , “ how many different grocery chains/stores do you regularly shop (defined as at least once a month)?” This is a comprehensive measure of transaction cost the consumer faces since it incorporates both the willingness and ability of a customer to travel to another store, as in *distance* and *mobility*. If the respondent lives in a rural area with few stores in reasonable distance, travel to another store is limited. This may mean that finding OOS produce at another store requires a large amount of resources. Conversely, the respondent may live in an urban area with a multitude of stores in a small area is needs to utilize relatively few resources to go to another store.

Respondents also reported their loyalty to regularly frequented stores by stating they were either loyal, or not loyal, to any particular store or chain, thus influencing their willingness to go to another store. Respondents that indicate they are loyal are expected to be more likely to delay purchase since they value purchasing products from the particular store more than visiting another store.

The next variable is more specific measure than general store loyalty, focusing on fruit and vegetable loyalty. It reveals if the consumer feels attached to a particular store's produce, not just the store. Establishing produce loyalty is important to specific store loyalty since there is little brand recognition within produce.

Respondents also rated how important quality was in selecting a grocery store on a 5-point scale. Since there is little brand recognition within produce (Baltas and Papastathopoulou 2003), quality is not attached to a particular produce company, but to the store. It is very plausible that a consumer who states

quality is important may feel that a banana of the same brand is of higher quality at one store than another. Since the respondent stated quality is important, they are likely selecting a store where they perceive higher quality products, thus they would be expected to be more willing to delay purchase.

Respondents indicated how often they shop for groceries, purchasing 5 or more items. This is expected to influence the opportunity cost- the capability of the respondent to immediately consume any good. Fewer visits per week mean longer intervals of time before the desired good can be replenished.

In addition to the behavioral variables, demographics (education, age, gender, and country of residence) were also collected and included in the model.

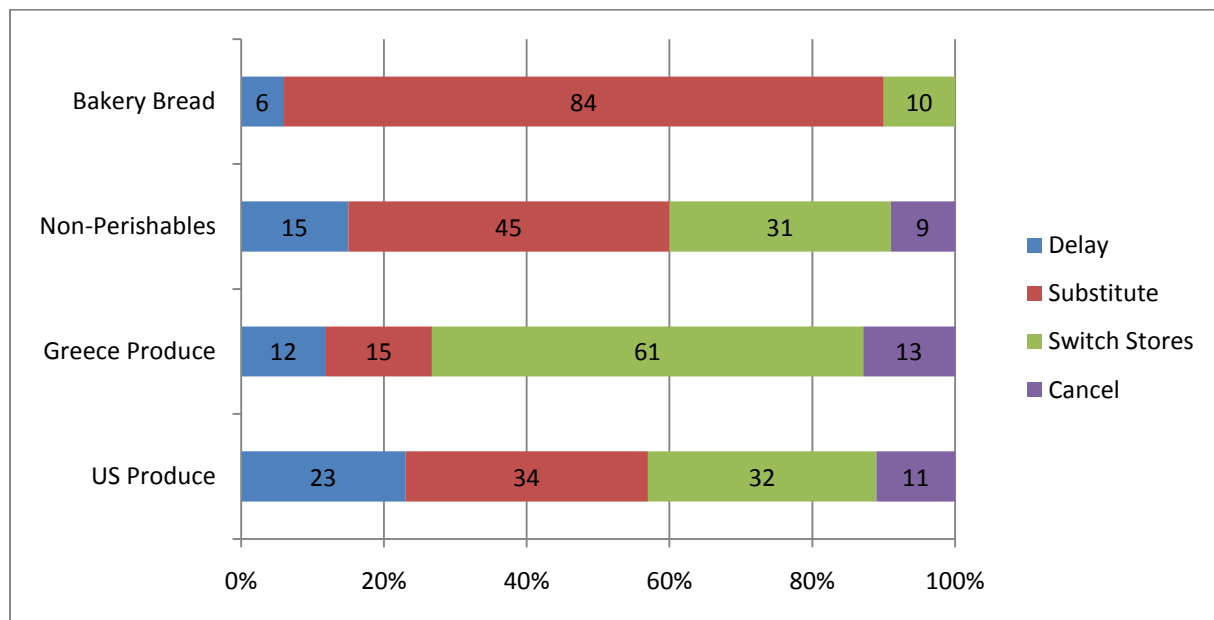
## **Results**

We first analyze the consumers' stated response to OOS produce and compare the results with the non-perishable response found in the Gruen and Corsten (2000) study and the perishable bread response found in the Van Woensel et al (2006) (Figure 1). Visual inspection indicates that produce is different than the results from other categories. Out of stock response in produce by respondents from the US is comparable to the 8-category OOS non-perishable response. The main difference is a 9% decrease in substitution, which is replaced by an 8% increase in delay. Greek consumers, however, were very different from the 8-category responses. Overall, 61% of Greek consumers reacted to OOS produce by switching stores. This is complemented by a 30% decrease in their rate of substitution, bringing the substitution total to 15%. Additionally, 12% said they would delay and 13% would cancel the purchase.

For Greece and the US, OOS produce responses differ substantially from that of perishable bread. The choice to substitute falls by 40% in the US and 69% in Greece. This is replaced by a 17% and 6% increase in delay for the US and Greece, respectively. Lastly, the rate of switching stores increases by 22% in the US and 51% in Greece. Clearly, there is major deviation in the response to produce compared to that of bread.



**Figure 1 Out of Stock Responses**



**Source: Gruen et al 2002, Van Woensel et al 2006**

To further understand consumer response to out of stock situations in produce, we conducted a regression analysis for the responses switch stores, delay purchase, and substitute item. The regression for each model is as follows:

Reaction (delay, substitute, or switch stores) =  $f$ (Ease of access, number of stores, loyalty, quality, fruit and vegetable loyalty, education level, age, gender, and country of residence).

**Table: 1 Summary Statistics**

| Variable         | Mean  | Standard Deviation | Cases |
|------------------|-------|--------------------|-------|
| Switch Stores    | 0.372 | 0.484              | 570   |
| Delay Purchase   | 0.175 | 0.381              | 570   |
| Substitute       | 0.249 | 0.433              | 570   |
| Access           | 3.802 | 1.241              | 560   |
| Number of Stores | 2.436 | 0.984              | 566   |
| Loyalty          | 0.667 | 0.472              | 559   |
| Quality          | 4.643 | 0.715              | 569   |
| Produce Loyalty  | 0.712 | 0.453              | 570   |
| Education        | 2.687 | 1.156              | 568   |
| Age              | 4.300 | 1.438              | 566   |
| Male             | 0.458 | 0.499              | 570   |
| Greece           | 0.460 | 0.499              | 570   |

**Table 2: Marginal Effect and Significance**

| Variable           | Switch Stores | Delay Purchase | Substitute |
|--------------------|---------------|----------------|------------|
| Access             | -0.061***     |                |            |
| Number of Stores   | 0.049**       | -0.042**       |            |
| Shopping Frequency |               | 0.026*         |            |
| Age                | -0.025*       | -0.021*        |            |
| Greece             | 0.172***      | -0.120***      | -0.219***  |

**Values are the Marginal Effect of a 1 unit increase in the explanatory variable.**

**\*\*\*p<.01, \*\*p<.05, \*p<.1**

Results from the regression analysis are shown in Tables 3-5. For the model that predicts if a consumer would switch stores for the out of stock item, the significant variables were ease of access, number of stores, age, and country of residence. For the model predicting purchase delay, number of stores, shopping frequency, age of respondent, and country of resident were all significant. There was only one significant variable, country of residence, for the substitute product model.

**Table 3. Regression Results for Switch Stores**

| <b>Variable</b> | <b>Coefficient</b> | <b>Standard Error</b> | <b>P[ Z &gt;z]</b> | <b>Marginal Effect</b> |
|-----------------|--------------------|-----------------------|--------------------|------------------------|
| <b>ACCESS</b>   | -.161              | .048                  | .001               | -.061                  |
| <b>NUMB</b>     | .129               | .058                  | .027               | .049                   |
| <b>LOYAL</b>    | -.124              | .130                  | .340               | -.047                  |
| <b>QUAL</b>     | .059               | .061                  | .331               | .022                   |
| <b>SHOPFREQ</b> | .004               | .052                  | .935               | .002                   |
| <b>FV_SS</b>    | .021               | .126                  | .865               | .008                   |
| <b>EDUC</b>     | -.065              | .054                  | .229               | -.024                  |
| <b>AGE</b>      | -.067              | .040                  | .093               | -.025                  |
| <b>MALE</b>     | -.053              | .118                  | .651               | -.020                  |
| <b>GREECE</b>   | .455               | .136                  | .001               | .171                   |

**Table 4. Regression Results for Delay Purchase**

| <b>Variable</b> | <b>Coefficient</b> | <b>Standard Error</b> | <b>P[ Z &gt;z]</b> | <b>Marginal Effect</b> |
|-----------------|--------------------|-----------------------|--------------------|------------------------|
| <b>ACCESS</b>   | .066               | .057                  | .251               | .016                   |
| <b>NUMB</b>     | -.170              | .068                  | .013               | -.042                  |
| <b>LOYAL</b>    | .114               | .156                  | .464               | .028                   |
| <b>QUAL</b>     | -.080              | .068                  | .242               | -.020                  |
| <b>SHOPFREQ</b> | .104               | .063                  | .098               | .026                   |
| <b>FV_SS</b>    | .040               | .149                  | .790               | .010                   |
| <b>EDUC</b>     | -.088              | .064                  | .169               | -.022                  |
| <b>AGE</b>      | -.085              | .045                  | .059               | -.021                  |
| <b>MALE</b>     | -.113              | .134                  | .399               | -.028                  |
| <b>GREECE</b>   | -.492              | .158                  | .002               | .120                   |

**Table 5. Regression Results for Substitution**

| <b>Variable</b> | <b>Coefficient</b> | <b>Standard Error</b> | <b>P[ Z &gt;z]</b> | <b>Marginal Effect</b> |
|-----------------|--------------------|-----------------------|--------------------|------------------------|
| <b>ACCESS</b>   | .033               | .053                  | .537               | .010                   |
| <b>NUMB</b>     | -.083              | .062                  | .181               | -.025                  |
| <b>LOYAL</b>    | -.227              | .148                  | .125               | -.070                  |
| <b>QUAL</b>     | -.028              | .070                  | .686               | -.009                  |
| <b>SHOPFREQ</b> | -.016              | .055                  | .775               | -.005                  |
| <b>FV_SS</b>    | -.016              | .134                  | .908               | -.005                  |
| <b>EDUC</b>     | -.027              | .059                  | .641               | -.008                  |
| <b>AGE</b>      | .020               | .042                  | .636               | .006                   |
| <b>MALE</b>     | .053               | .125                  | .675               | .016                   |
| <b>GREECE</b>   | -.748              | .156                  | .000               | -.219                  |

Ease of access was significant and negatively related to switching stores. This indicated that there was a 6.1% decrease in likelihood to switch stores to replace the item for every unit increase in the rating of importance of ease of access in selecting a grocery store. Ease of access was not important for any other models.

The number of stores was significant ( $p < .05$ ) in both the model for switching stores and delaying the purchase for the OOS produce. As expected, the result was in a positive direction for switching stores, where a greater number of stores regularly frequented increased the chance to switch stores by 4.9%. Also as expected was the negative direction of the choice to delay the purchase, meaning those that those who go to fewer stores are 4.2% more likely to delay the purchase.

The shopping frequency of the consumer was marginally significant in the model to delay the purchase of out of stock items. A consumer who shops more often is 2.6% more likely to delay purchases until the next shopping trip. This follows intuition since shorter time spans between trips means less time not having the product. It was not significant predicting the choice to switch stores or the choice to substitute items.

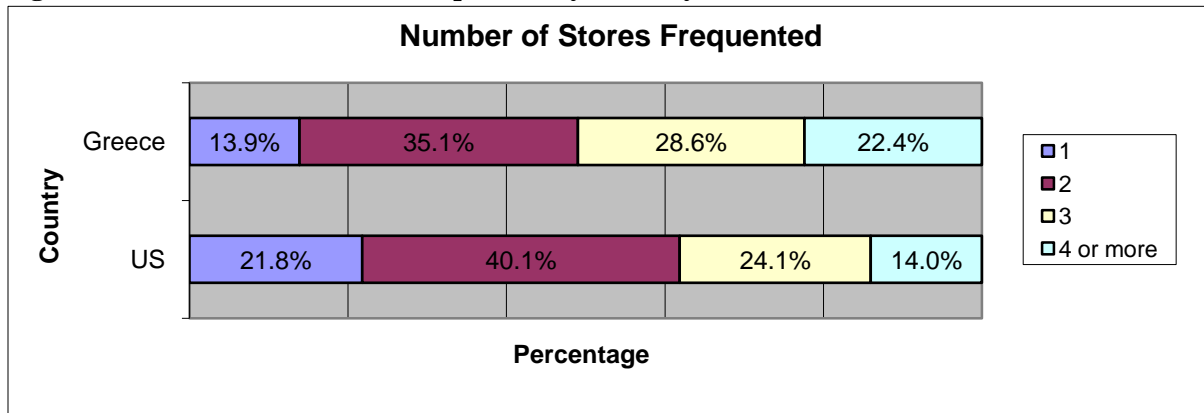
An unexpected result was the marginal significance of the respondent's age in the negative direction for both the option to switch stores and delay the purchase. This means that as the respondent's age increased, it decreased the chance of switching stores by 2.5% and decreased the chance of delaying the purchase by 2.1%. It is unclear what the underlying logic would explain the relationship. One idea is that while older consumers have more time dedicated to regularly scheduled shopping, younger consumers typically have fewer responsibilities to their jobs and families, meaning more personal time and more opportunity to get the same product elsewhere. This same theory may explain delaying the purchase less often since an older shopper is more likely to be shopping for others in their household who are unwilling to go without the product. Age was not important to predicting if the respondent would substitute the OOS item.

Lastly, the respondent's country of residence was significant ( $p < .01$ ) in predicting the respondent's reaction to out of stock situations in all models. Country had the greatest effect for all 3

stock-out responses. It positively increased the chance of Greeks switching stores by 17.2%. US consumers are 12.0% more likely to delay their purchases and 21.9% more likely to substitute for the OOS item.

This confirms that characteristics specific to the country’s shopping structure and possible cultural factors dictates consumer habits between countries. This is consistent with other results, specifically the number of stores that shoppers in each country regularly visit. Greeks regularly frequent numerous stores because the density and ability to switch stores is relatively easy. A slight majority frequent 3 or more stores in Greece, while 62% of United States’ consumers only go to 1 or 2 stores. Greeks’ low transaction cost involved in visiting multiple stores overrides other economic considerations, making immediate replacement of OOS items elsewhere the least costly option. US consumers visit fewer stores because of their high transaction costs. This increases the likelihood of delay or substitution within the same store.

**Figure 1 The Number of Stores Frequented by Country**



**Source: This study**

Overall, the other behavioral variables; loyalty, produce loyalty, and quality were not significant in the models to predict store switching or delay the purchase. While quality is important in selecting specific stores (Baltas 2003; Campo et al 2000) in other studies, it plays no part in predicting OOS produce response. Furthermore, the remaining demographic variable education was not significant in any of the 3 models.

## **Discussion and Limitations**

Our results indicate that there are significant differences in the way consumers respond to OOS produce compared to other categories. Overall, there is similarity in the way US consumers respond to OOS produce compared to non-perishables. Compared to the average non-perishable reaction, there is an 11% decrease in the frequency of substitution and an 8% increase in the rate of delaying purchase in the United States. In Greece we find a 30% increase in those who would switch stores and a 30.5% decrease in the frequency of substitution.

After examining what motivates consumers to select their response to out of stock situations, we find that some of the economic principles suggested by Campo et al 2000 are followed. The variables that proved most significant were the importance of store accessibility and the number of stores consumers frequent. Within this analysis, confirmed by the cumulative responses frequencies, the country of the respondent does make a difference in the decision to react to OOS. For either country, the findings are contrary to Van Woensel et al, in that produce is much less likely to be substituted. For the US, consumers are less willing to substitute and more willing to delay for produce. In Greece, the overwhelming choice to switch stores means that the transaction cost of purchasing elsewhere is lower than substituting or delaying the purchase. One possible explanation is the culture in Greece where daily cooking is the norm and produce is often part of a larger meal and thus needed immediately. With such low transaction costs, Greeks would switch stores due to unacceptable produce quality, as well as an out of stock situation. Conversely, US consumers' higher transaction costs mean a higher probability to choose an option within the same store.

Overall, the model to explain the difference and reason for making particular OOS responses only provided a moderate amount of explanation to determine produce OOS response. We find that the number of stores is a significant factor in the consumer decision to switch stores and, accordingly, is negatively related to the decision to delay. We also find that consumers who have greater ease of access are significantly less likely to switch stores. Thus, produce falls in line with the economic consideration of transaction costs.

Other than transaction cost, the predictive success of our model was not reliable in predicting OOS produce response according to economic rationale. We have shown that normal factors need further testing and evidence to be considered useful in predicting responses. The variables in the standard models do not predict consumer behavior associated with OOS produce. The model to switch stores for the OOS item improved the prediction **4.1%** above the naïve prediction. Within the delay and substitution analyses, the model's prediction was identical to the naïve prediction. Further examination into what dictates the consumer choices for out of stock produce is necessary for development of an accurate model.

A main concern affecting the validity of our study is the hypothetical nature of the dependent variable. Consumers were asked to respond to a supposed situation, not an actual OOS predicament. Van Woensel et al 2007 observed that for OOS bread response, stated response and actual response are quite different. Even with this precaution, the results of produce are so divergent from the bread response that we can say with some confidence that there is a difference.

Lastly, we did not analyze data on the frequency of OOS produce. This means that while there is a significant difference in the way consumers respond to OOS produce, the impact on the retailer may only be minimal if the frequency of OOS produce is negligible. Additionally, the inherent seasonality of produce may mean that the supply of produce is out of management's control.

Previous research on the density and relative closeness of stores found that the transaction cost is substantially lower than the other economic considerations. This is apparent because of the majority of Greek consumers chose to switch stores. Furthermore, location has also been established as one of the most important factors to Greek consumers during shopping. A further study should focus on the predominance of low transaction cost (and switch stores) in Greece and how it applies to other perishable and non-perishable products.

## **Conclusion**

We find that the response to OOS produce to be significantly different than previous studies on perishable and non-perishables. The United States was similar to non-perishables, except consumers

substitute less often and delay more often. Greek respondents were overwhelmingly different non-perishables, with a majority electing to switch stores. Both countries deviated substantially from previous perishable data. Retail managers are now more informed of the consumer response to produce. Unlike fresh baked bread, there is a much greater likelihood for the customer to replace the item elsewhere resulting in lost sales for the grocery store.

The various economic principles that dictate OOS produce response were found to be somewhat influential, specifically transaction costs such as the importance of store access and the number of stores visited. The respondent's country was the most significant and had the greatest effect of all variables in each of the 3 regressions.

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