What Happens when More Starbucks Cafés Come to Town?

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Abstract

This paper studies the extent to which the presence of Starbucks café shops in a local market impacts the sales, prices and profitability of Starbucks and competing non-Starbucks packaged ground coffee products sold in grocery stores. We begin the study by proposing a formal theoretical model which shows the increasing presence of Starbucks café shops has two opposing effects, "*market expanding*" and "*business stealing*" effects, on the demand of packaged ground coffee products sold in grocery stores, and leads to (*i*) an increase in prices, but an increase or decrease of quantities sold of Starbucks branded products; and (*ii*) an increase or decrease of prices and quantities sold of non-Starbucks branded products. We then conduct empirical analysis to examine the systematic evidence on the market outcomes resulting from the increasing presence of Starbucks café. The counterfactual experiments support our theory and reveal that an entry of an additional Starbucks café shop would unanimously raise the retail prices of Starbucks-branded packaged ground coffee products across all the markets, but have ambiguous impacts on other market outcomes such as the quantities, profits of Starbucks and competing non-Starbucks packaged ground coffee products. The empirical analysis also shows the magnitudes of above impacts vary by the initial number of Starbucks café shops in a market.

Keywords: Starbucks Cafés, Grocery Stores, Packaged Ground Coffee, Business Stealing Effect, Market Expanding Effect

JEL classification codes: L13, D12, L66

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1. Introduction

The increasing number of consumer goods and services in recent years is a consequence of the diligent efforts that firms have been putting on proliferating their product lines to meet consumers' ever-changing needs and preferences. When a firm extends its product line, it needs not only to decide which type of new products to launch but also to carefully coordinate the relationship between the new products with the existing products. On one hand, if two products are posited too "closely" with each other in the product line, for example, having similar quality or functionality, a business-stealing effect can easily occur, which shifts the existing consumers between products and leads to gains of one product and losses of the other. On the other hand, a multi-product firm wants to leverage the reputation of established products and brands to promote the sales of new products. This idea is well expressed by Michael Conway, a Starbucks executive vice president, when he explained the company's strategy of launching packaged ground coffee in grocery stores: "Because of the impression we make every day in the cafés, we don't have to work as hard when we launch new products". [1] The coexistence of business cannibalization and market expansion effects complicates the interrelationship between products as well as the business decisions of a firm, because a strategy which is meant to be applied to one product category can have an ambiguous impact on the profit of another product category of the firm, and sometimes the impact can even spill over to the related products of competing firms. This calls for firms and researchers to consider these two types of effects across products and across firms when evaluating product strategies.

In this paper, we study the business stealing and market expanding effects of a particular type of business strategy, the presence of Starbucks café shops on the sales and prices of packaged ground coffee products of Starbucks and its competitors in grocery stores. Starbucks, the Seattle-based coffee chain, since it opened its first coffee store in 1971, has aggressively expanded its café brand by locating thousands of café shops across the world. In contrast to the rapid growth of café shops, it took Starbucks a long time to launch and grow its business of consumer-packaged coffee products. In 1989, 18 years after it was founded, the company began providing private-label coffee in Costco under the Kirkland Signature Brand. In 1998, Starbucks partnered with Kraft to distribute its packaged coffee in grocery stores, but this partnership was terminated by Starbucks

[1] "Starbucks' grocery gambit" by Beth Kowitt, Fortune, December 5, 2013. http://fortune.com/2013/12/05/starbucks-grocery-gambit/

in late 2010 as Starbucks alleged that Kraft failed to market its brands in grocery stores satisfactorily.[2] Subsequently, Starbucks decided to own and control its packaged ground coffee products by itself. "Shouldn't our shareholders benefit from our ability to build a brand inside Starbucks?" the company's CEO Howard Schultz said, "as opposed to selling a category or product that is something that we don't own or have equity in?"[1]

To explore the consumer brand awareness accumulated by its café shops, Starbucks placed so-called "Signature Aisles" in grocery stores to "feature bags of coffee under a sign with Starbucks' distinctive mermaid logo"[2]. Moreover, Starbucks extended its loyalty program from café shops to grocery store aisles. In particular, the loyalty program members who buy Starbucks ground coffee products in grocery stores can earn rewards points that can be redeemed for coffee, food and merchandise in Starbucks cafés. Those who redeem rewards points in Starbucks cafés can receive coupons for their future purchases of Starbucks ground coffee products in grocery stores. The fact that Starbucks diligently strives to leverage the strong reputation and value created by its café shops when promoting its packaged ground coffee products makes it interesting to investigate the interactions of these two streams of product lines, namely: To what extent the presence of Starbucks café shops impacts the sales of ground coffee products of Starbucks and non-Starbucks brands in grocery stores?

We first propose a theoretical model to illustrate the business-stealing and market expanding effects of Starbucks café shops on consumers' demand for packaged ground coffee and the equilibrium pricing decisions of Starbucks and its competitor on their ground coffee products. Specifically, we assume there are two types of consumers in the market: one type of consumers only consume coffee beverage in Starbucks cafés, while the other type of consumers usually purchases packaged ground coffee from grocery stores where there are two brands for them to choose: Starbucks and Folgers. The proportion of grocery coffee shoppers decreases with the number of Starbucks cafés: when there are more Starbucks cafés in a market, consumers more easily patronize a café to grab a cup of barista-cooked coffee and therefore become less likely to buy packaged coffee from supermarkets. This is referred as *"business stealing effect"*. Meanwhile, for those consumers who continue to buy ground coffee in grocery stores, the presence of

[2] "Starbucks Aims For Grocery Store Supremacy With New Signature Aisle" by Rachel Tepper, Huffton Post, April 26, 2013. https://www.huffingtonpost.com/2013/04/26/starbucks-grocery-store-aisle_n_3157075.html

Starbucks café shops also shifts their preferences for Starbucks and Folgers ground coffee in two distinct ways.

Firstly, Starbucks café shops offer consumers opportunities to try a variety of coffee drinks and explore their preferences over different types or flavours of coffee. Consumers then can use the ground coffee purchased from grocery stores to make their ideal coffee drink. This *"market expanding effect"* can boost consumers' demand for the ground coffee products of both Starbucks and Folgers if the two brands do not fully cover the market of grocery coffee shoppers. Secondly, the presence of Starbucks café shops may increase consumers' perceived utility of Starbucks ground coffee in a magnitude higher than that of Folger ground coffee, driven by increased consumer awareness of the Starbucks brand as well as the benefits associated with the Starbucks loyalty program. Such a *"market expanding effect"* enhances the demand for Starbucks branded products disproportionately more than Folgers branded products.

Therefore, depending on the relative magnitudes of the "*business stealing effect*" and "*market expanding effect*", the presence of Starbucks café shops can have either a positive or a negative effect on the quantities of Starbucks and Folgers ground coffee sold in grocery stores. After formulating product-specific demands of the two brands of ground coffee as functions of the number of Starbucks cafés, we proceed to derive the equilibrium prices of the two brands and conduct comparative static analyses. The comparative static analyses show that the number of Starbucks café shops increases the equilibrium price of Starbucks ground coffee but has an ambiguous effect on the equilibrium price of Folgers ground coffee. As for quantities of ground coffee sold, the presence of Starbucks cafés also has a mixed impact on the equilibrium quantities of the two brands.

Our theory suggests that under business stealing and market expanding effects, the presence of Starbucks cafés has an ambiguous impact on the sales and prices of packaged ground coffee of Starbucks and its competitors. The theoretical ambiguity makes it necessary to examine the impacts in real-world settings. So next we propose a structural econometric model to empirically estimate the parameters which govern the market demand and supply of Starbucks and non-Starbucks packaged ground coffee products sold in grocery stores. The estimated model is subsequently used to simulate new market equilibrium outcomes based on an assumed counterfactual change in the number of Starbucks café shops present in the relevant market.

We use a nested logit model to capture empirical demands for ground coffee products grocery stores. A nested logit model is flexible enough to capture consumers' heterogeneous preferences for a variety of brands of packaged ground coffee products. We normalize the utility obtained from the outside option (e.g., purchasing coffee from Starbucks cafés, purchasing instant coffee or other substitute beverages) to be zero. Therefore, the consumer's indirect utility in our empirical demand model eventually represents the comparative utility of purchasing a certain brand of ground coffee to that of choosing the outside option.

We assume the consumer's indirect utility to be a function of a series of product characteristics, and measured factors that influence the consumer's utility obtained from purchasing ground coffee products from grocery stores. Among the measured factors influencing consumers' utility obtained from purchasing ground coffee products from grocery stores, two variables are of particular interest: (*i*) the number of Starbucks cafés in the relevant market; and (*ii*) the interaction variable formed from the product of the number of Starbucks cafés in the relevant market and a zero-one dummy variable that equals to one only for Starbucks ground coffee products. The first variable is used to capture the impact of the number of Starbucks cafés on consumers' utility of purchasing non-Starbucks ground coffee products from grocery stores. According to our theory, this impact can be either positive or negative, depending on the relative magnitudes of business stealing and market expanding effects. The interaction variable is used to capture the additional (dis)utility consumers attach to Starbucks ground coffee products as compared to non-Starbucks brands, driven by the presence of Starbucks cafés. Our theory predicts this additional utility to be positive. The econometric demand estimation results show that the parameters associated with the number of Starbucks cafés and its interaction term with Starbucks brand dummy variable are both positive, providing evidence that the presence of Starbucks café shops increases consumers' demand for packaged ground coffee products of Starbucks and its competitors. These empirical results suggest that, on average, the market expanding effect outweighs business-stealing effects.

We then use the estimated econometric demand and supply model to conduct counterfactual experiments, the aim of which is to assess how much the prices, sales and profitability of packaged ground coffee products are influenced by a marginal change in the number of existing Starbucks café shops in the same zip-code market. Specifically, we counterfactually allow a marginal entry of one additional Starbucks café shop across all markets and resolve for the new set of market equilibrium prices for packaged ground coffee products sold in grocery stores. The new set of market equilibrium prices is used to recover other counterfactual market equilibrium outcomes of interest including product-level quantities and variable profits.

Comparing actual market outcomes to counterfactual market equilibrium outcomes reveal the following. First, when the number of existing Starbucks café shops is increased by one, the equilibrium prices of Starbucks retail packaged ground coffee products increase across all markets; whereas the equilibrium prices of non-Starbucks retail packaged ground coffee products increase unambiguously in markets with no and low presence of Starbucks café shops but either increase or decrease in markets with high presence of Starbucks café shops, a result consistent with the theory predictions. Moreover, we find the predicted product prices of Starbucks coffee products tend to increase in greater magnitude in markets that have a larger number of existing Starbucks cafés. For example, the average retail Starbucks packaged ground coffee product price increase is merely 0.07% in markets that initially have no Starbucks cafés; whereas, it is more than 16% in markets that initially have 4 Starbucks cafés. This pattern, however, is not found for non-Starbucks packaged ground coffee products. The empirical evidence suggests that the counterfactual entry of an additional Starbucks café shop in a zip-code market drives a greater marginal positive impact on the retail prices of Starbucks-own coffee brands than its competing coffee brands in grocery channel in markets with lower presence of Starbucks café shops; whereas it implies an outweighed negative marginal impact on the retail prices of non-Starbucks coffee brands in grocery channel in markets with high presence of Starbucks cafés.

Second, in terms of market equilibrium quantity changes, we find the counterfactual entry of an additional Starbucks café presence may have a positive or negative impact on equilibrium quantities sold of Starbuck and non-Starbucks packaged ground coffee products in grocery stores in markets with no or low presence of Starbucks café shops. For instance, among all the markets in our data that sell Starbucks packaged ground coffee products, a majority of these markets, 14,382, are predicted to experience a mean increase in the monthly quantity sold of Starbucks packaged ground coffee products, while only 943 markets with no or only one existing Starbucks cafes are predicted to experience a mean decrease in the monthly quantity sold of Starbucks packaged ground coffee products. A mixed result is also found for non-Starbucks brands: 16,104 markets have mean predicted monthly quantity sold increase and only 1,123 markets with no or only one existing Starbucks café have mean predicted monthly quantity sold decrease. The above ambiguous changes also coincide with the prediction of our theory: the increase in the number of Starbucks café shops in a market can have either positive or negative impact on the sales of ground coffee products, both Starbucks and competing non-Starbucks brands, in grocery stores.

Last, we examine the counterfactual changes in variable profits. Similar to what we find for quantity changes, the predicted variable profits of Starbucks and non-Starbucks brands ground coffee products sold in grocery stores can either increase or decrease due to the counterfactual entry of one additional Starbucks café shop.

The paper proceeds as follows. In the next section, we briefly review the relevant literature. In section 3 we specify and analyze a simple theoretical model, from which we draw insights that are empirically testable. Section 4 discusses the data used in the empirical analysis. Section 5 describes the empirical model, as well as estimation and identification of parameters in the empirical model. Section 6 presents and discusses the empirical results. Section 7 concludes the paper.

2. Related Literature

This paper joins the literature of "umbrella branding" and "brand extension". Brand is one of the most important assets of firms. It is very common for a multi-product firm to label several products under the same brand name, a practice which is termed "umbrella branding" or "brand extension" (Aaker and Keller (1990), Pepall and Richards (2002)). Umbrella branding is a justifiable firm strategy posited by two distinct theories in the literature. First, it has been shown that umbrella branding is a rationale strategy within the theoretical framework of adverse selection models. Specifically, using an adverse selection model, it can be shown that firms, under some conditions, will find it optimal to leverage the reputations created by existing products and brands to signal the high quality of new products (Wernerfelt (1988), Choi (1998), Cabral (2000), Miklos-Thal(2012), Moorthy(2012)). Second, it has also been shown that umbrella branding is a rationale strategy within the theoretical framework of moral hazard models. In particular, it has been assumed within a moral hazard model framework that firms' product quality choice is endogenous, and scholars use this theoretical framework to demonstrate that umbrella branding may lead to a larger scope of high-quality investment when a firm simultaneous chooses the qualities of multiple products (Andersson (2002), Cai and Obara (2006), Hakenes and Peitz (2008), Cabral(2009), Rasmusen(2010)).

There also exists a rich body of empirical work which documents the spillover of brand image among products under the same brand name (see Keller and Lehmann (2006) for an overview). For instance, Sullivan (1990) finds the Audi 5000's alleged sudden-acceleration defect has a significant negative impact on the demand for Audi 4000 and Quattro, whereas the launching of Jaguar's new model leads to an increase in demand for its old model as a result of advertising used to promote the new model. Erdem (1998) proposes a model in which consumers' quality perceptions regarding a brand in one product category are affected by their experiences with the same brand in another category. The model is estimated on panel data for toothpaste and toothbrushes and the results show that the correlation coefficient of consumers' prior beliefs about the qualities of two umbrella products is 0.882, which is taken as an empirical support to the signalling theory of umbrella branding.

Our project investigates spillover effects of Starbucks café shops on the demand and pricing of its umbrella branding products, Starbucks packaged ground coffee products sold in grocery stores, as well as the competing brands' packaged ground coffee products sold in grocery stores. This research is different from previous empirical work of umbrella branding in two important ways. First, we allow the co-existence of both positive and negative spillover effects associated with a firm's action in a given product category. A positive spillover effect increases the demand for related products, while a negative spillover effect decreases the demand for related products. Furthermore, we allow the relative magnitudes of these opposing effects to vary by the number of Starbucks café shops in a given market. Second, we not only analyze the demand spillovers within umbrella branding products but also explore the potential spillovers across competing brands, based on which we can more accurately evaluate the impacts of Starbucks cafés on the equilibrium prices and quantities sold of different brands of packaged ground coffee in grocery stores. Moreover, before performing empirical analyses, we propose a theoretical framework to demonstrate how the number of Starbucks café shops can influence equilibrium prices and quantities of Starbucks and non-Starbucks packaged ground coffee products. This theoretical analysis sheds light on the empirical results we later find.

Spillover effect has also received a lot of attention in the advertising literature. In this sense, our work is also related to that strand of literature. For instance, Garthwaite (2014) studies the economic effect of celebrity endorsements in the publishing sector. The study finds that celebrity endorsements increase consumers' purchases of endorsed books and generate spillover benefits for the non-endorsed titles written by an endorsed author. However, the aggregate adult fiction sales fall with endorsements, which suggests endorsements are more of a business stealing effect type of advertising in this case. Chae et.al.(2016) investigate the spillover effects of seeded marketing campaigns (SMCs) on the generation of "word of mouth" (WOM) at the brand and category levels. Using a data set about cosmetics brands, they find brand- and category-level WOM spillover effects. Our paper contributes to the literature by focusing on another important dimension of firms' strategies, which is the choice of café shop location and studying its spillover effects on the products sold through grocery channels.

3. Theoretical Insights

3.1 Model setup

Suppose there are two coffee manufacturing firms that correspond to two brands, Folgers (F) and Starbucks (S), respectively, each of which produces a packaged ground coffee product and sells through retail grocery stores. Starbucks also serves consumers fresh-made coffee beverage through its company-operated or franchised café shops. Consumers can either purchase packaged ground coffee from grocery stores and make a drink by themselves or visit a Starbucks café shop to enjoy barista-prepared coffee. We assume the number of consumers which purchase ground coffee is of measure m, and the number of consumers for Starbucks café shop is of measure $1-m$, where $m \in (0,1)$.

The presence of Starbucks café shops can influence consumers' purchasing behaviour for the two brands of packaged ground coffee in two ways. On one hand, when more Starbucks café shops enter a market, consumers can more easily stop by one café to grab a cup of coffee and thus reduce the purchases of packaged ground coffee from grocery stores. We model this *"business stealing effect"* by assuming the number of consumers that buy ground coffee products from grocery stores is $m(N_S)$, which is a decreasing function of the number of Starbucks café shops N_S, i.e., $m'(N_S) < 0$. On the other hand, the presence of Starbucks café shops could enhance consumers' valuations for packaged ground coffee products. Starbucks café shops offer consumers opportunities to try a variety of coffee drinks and explore their preferences over different types or flavors of coffee. Consumers then can use the packaged ground coffee purchased from grocery stores to make their ideal coffee drink. This *"market expanding effect"* can potentially benefit the sales of both Starbucks and Folgers packaged ground coffee in grocery stores. Moreover, the "market expanding effect" is likely to be more pronounced for ground coffee products of Starbucks than Folgers for two reasons: first, the presence of Starbucks cafés increases consumers' awareness of Starbucks brand and make them more likely to choose the packaged ground coffee of the same brand. Second, Starbucks loyalty program members who purchase Starbucks packaged coffee from groceries can earn Starbucks rewards points redeemable for free coffee, food and merchandise in local Starbucks café stores. Consumers who redeem rewards points can further get coupons for their future purchases of Starbucks packaged ground coffee. [1] An increase number of Starbucks café shops facilitates consumers to redeem Starbucks rewards points and increases the benefits associated with the purchases of Starbucks packaged ground coffee.

In the model, the "market expanding effect", is captured by allowing the number of Starbucks café shops to shift a consumer's utility of purchasing the two brands of packaged ground coffee in grocery stores:

$$U_S = v_0 + (1+\theta)v(N_S) - t_k x - p_S \tag{1}$$

$$U_F = v_0 + v(N_S) - t_k(1-x) - p_F \tag{2}$$

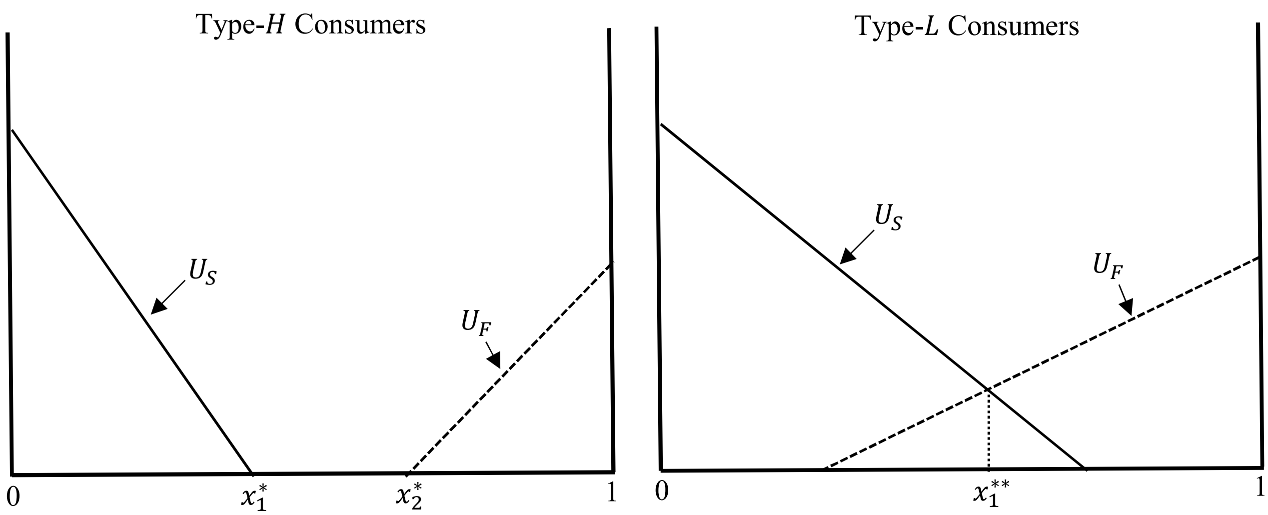
Here v_0 denotes the intrinsic value of ground coffee. $(1+\theta)v(N_S)$ and $v(N_S)$ are the incremental value a consumer attaches to the packaged ground coffee of Starbucks and Folger respectively, both of which increase with the number of Starbucks café shops, N_s, but in different rates: $(1+\theta)v'(N_S) > v'(N_S) > 0$. The parameter $\theta \geq 0$ measure the extent to which Starbucks become more favorable for consumers than Folgers as N_s increases.

We assume that consumers have heterogeneous preferences with respect to the products of Starbucks and Folgers. Specifically, Starbucks and Folgers are respectively located on the endpoints 0 and 1 of a Hotelling line of length one. The consumers who want to purchase packaged ground coffee from grocery stores are uniformly distributed along the line and each has a location indexed by $x \sim U[0,1]$: the smaller x is, the more the consumer prefers Starbucks. The unit "transportation cost" is denoted as $t_{k\in\{H,L\}}$, which takes two values $t_H > t_L > 0$, depending on how consumers perceive the two brands. Type-H consumers are loyal consumers who strongly prefer one brand and are reluctant to switch to the other brand, while type-L consumers are "switchers" who have a lower "transportation cost" to reach both brands. We assume type-H consumers take a proportion of α among all the $m(N_S)$ consumers who buy packaged ground coffee. To simplify the analysis, we also assume that each brand charges a uniform price to different types of consumers, and denote the price of Starbucks as p_S and the price of Folgers as p_F respectively.

3.2. Equilibrium analysis and comparative statics

In this section, we solve the equilibrium prices of the two brands $\{p_S^*, p_F^*\}$ and investigate the impact of the number of Starbucks café shops, N_S, on the equilibrium prices and quantities of Starbuck and Folgers. By the model setup, consumers of packaged ground coffee are composed of type-H and type-L consumers, whose transportation costs are t_H and t_L respectively. In order to simplify the equilibrium analysis, we assume that t_H is sufficiently high, while t_L is sufficiently low such that it is optimal for the two brands to partially cover the market for type-H consumers, but to fully cover the market for type-L consumers. In addition, we assume that θ, although positive, is small enough to guarantee Folgers has a positive market share among type-L consumers. Therefore, the demands of the two types of consumers can be illustrated in the following figure.

Figure 1: Consumers' Demand



From Figure 1, we can derive the market demand of each brand with respect to the two consumer segments. In the segment of type-H consumers, each firm sells as a local monopoly and obtains a market segment demand equal to:

$$Q_S^H = \alpha m(N_S) x_1^* \tag{3}$$

$$Q_F^H = \alpha m(N_S)(1 - x_2^*) \tag{4}$$

where $m(N_S)$ is the total number of consumers that purchase packaged ground coffee; α is the proportion of type-H consumers; x_1^* is the location of a type-H consumer who obtains zero utility from purchasing the Starbucks brand packaged ground coffee product; and x_2^* is the location of a type-H consumer who obtains zero utility from purchasing the Folgers brand packaged ground coffee product. Using equation (1) and equation (2) to solve for x_1^* and x_2^* yield:

$$U_S = 0 \Leftrightarrow x_1^* = \frac{v_0 + (1+\theta)v(N_S) - p_S}{t_H} \tag{5}$$

$$U_F = 0 \Leftrightarrow x_2^* = 1 - \frac{v_0 + v(N_S) - p_F}{t_H} \tag{6}$$

In the market segment of type-L consumers, the two firms compete and split the market in the following way:

$$Q_S^L = (1 - \alpha) m(N_S) x_1^{**} \tag{7}$$

$$Q_F^L = (1 - \alpha) m(N_S)(1 - x_1^{**}) \tag{8}$$

where x_1^{**} is the location of a type-L consumer who is indifferent between purchasing the Starbucks brand packaged ground coffee product or the Folgers brand packaged ground coffee product. Using equation (1) and equation (2) to solve for x_1^{**} yield:

$$U_S = U_F \Leftrightarrow x_1^{**} = \frac{\theta v(N_S) - p_S + p_F}{2t_L} + \frac{1}{2} \tag{9}$$

Thus, the total demand for each brand of packaged ground coffee is:

$$Q_S = Q_S^H + Q_S^L = m(N_S)[\alpha x_1^* + (1 - \alpha) x_1^{**}] \tag{10}$$

$$Q_F = Q_F^H + Q_F^L = m(N_S)[\alpha(1 - x_2^*) + (1 - \alpha)(1 - x_1^{**})] \tag{11}$$

With the above demand functions, we write down the profits functions of Starbucks and Folgers:

$$\pi_S = m(N_S)[\alpha x_1^* + (1 - \alpha) x_1^{**}] p_S \tag{12}$$

$$\pi_F = m(N_S)[\alpha(1 - x_2^*) + (1 - \alpha)(1 - x_1^{**})] p_F \tag{13}$$

where the per-unit production cost for both brands is assumed to be zero for the ease of calculation. The first-order conditions with respect to p_S and p_F are as follows:

$$(p_S): \alpha\left(\frac{v_0+(1+\theta)v(N_S)-p_S}{t_H}\right)+$$

$$(1-\alpha)\left(\frac{\theta v(N_S)-p_S+p_F}{2t_L}+\frac{1}{2}\right)-p_S\left(\frac{\alpha}{t_H}+\frac{1-\alpha}{2t_L}\right)=0 \tag{14}$$

$$(p_F): \alpha\left(\frac{v_0+v(N_S)-p_F}{t_H}\right)+$$

$$(1-\alpha)\left(\frac{-\theta v(N_S)+p_S-p_F}{2t_L}+\frac{1}{2}\right)-p_F\left(\frac{\alpha}{t_H}+\frac{1-\alpha}{2t_L}\right)=0 \tag{15}$$

The equilibrium prices $\{p_S^*, p_F^*\}$ are equal to

$$p_S^*=\frac{1}{\Delta_0}[\Delta_1 v(N_S)+\Delta_3] \tag{16}$$

$$p_F^*=\frac{1}{\Delta_0}[\Delta_2 v(N_S)+\Delta_3] \tag{17}$$

where

$$\Delta_0 \equiv 4z^2+8zw+3w^2$$
$$\Delta_1 \equiv 2z^2(1+\theta)+zw(3+4\theta)+w^2\theta$$
$$\Delta_2 \equiv 2z^2+zw(3-\theta)-w^2\theta$$
$$\Delta_3 \equiv (2z+3w)(zv_0+wt_L)$$
$$z \equiv \frac{\alpha}{t_H}$$
$$w \equiv \frac{1-\alpha}{2t_L}$$

Comparative statics of equilibrium prices

Next, we conduct comparative statics analysis on the equilibrium prices $\{p_S^*, p_F^*\}$ in Equation (16) and (17). First, one can easily check that:

$$\partial\frac{p_S^*}{\partial N_S}=\frac{\Delta_1}{\Delta_0}v'(N_S)>0 \tag{18}$$

because $\Delta_0, \Delta_1 > 0$ and $v'(N_S) > 0$. The partial derivative in (18) implies that when Starbucks opens more café shops in a market, it increases consumers' perceived utility of Starbucks products and enables Starbucks to charge a higher price for its packaged ground coffee product in grocery stores. As for the impact on the equilibrium price of Folgers packaged ground coffee product, we have:

$$\partial \frac{p_F^*}{\partial N_S} = \frac{\Delta_2}{\Delta_0} v'(N_S) \tag{19}$$

the sign of which is undetermined because Δ_2 can be either positive or negative. Specifically, note that $\Delta_2 = 2z^2 + zw(3-\theta) - w^2\theta$ is a continuous function of α by the definitions of $z \equiv \frac{\alpha}{t_H}, w \equiv \frac{1-\alpha}{2t_L}$. When $\alpha \to 1$, i.e., the proportion of type-H consumers approaches one, we have:

$$\lim_{\alpha\to 1} z = \frac{1}{t_H};\ \lim_{\alpha\to 1} w = 0;\ \lim_{\alpha\to 1} \Delta_2 = \frac{2}{t_H^2} > 0, \tag{20}$$

while if $\alpha \to 0$, i.e., the proportion of type-H consumers approaches zero, we have:

$$\lim_{\alpha\to 0} z = 0;\ \lim_{\alpha\to 0} w = \frac{1}{2t_L};\ \lim_{\alpha\to 0} \Delta_2 = -\frac{\theta}{4t_L^2} < 0 \tag{21}$$

Therefore, there must exists an $\alpha^* \in (0,1)$ such that $\Delta_2 = 0$ at point α^*, and $\Delta_2 < 0$ on $\alpha \in [0, \alpha^*)$ and $\Delta_2 > 0$ on $\alpha \in (\alpha^*, 1]$. Moreover, because Δ_2 is a quadratic function of α, there exists a unique α^* such that $\Delta_2(\alpha^*) = 0$ on [0,1].

The analysis regarding Δ_2 suggests that the monotonicity of p_F^* depends on the ratio of type-H consumers: $\partial \frac{p_F^*}{\partial N_S} < 0$ for $\alpha \in [0, \alpha^*)$ and $\partial \frac{p_F^*}{\partial N_S} > 0$ for $\alpha \in (\alpha^*, 1]$. The economic intuition underlying this result is as follows. The packaged ground coffee market is segmented into two parts. The first part is composed by type-H consumers who either buy their favorite brand or not buy at all. In this segment of the market, the two brands do not directly compete with each other but rather behave like a monopoly to trade with their local loyal consumers. When the number of Starbucks café shops increases, the "market expanding effect" boosts the demand of the loyal consumers for each brand and incentivizes each brand to increase the price. Compared to type-H, type-L consumers are "switchers" who compare the two brands and buy from the one which yields higher utility. The presence of Starbucks café shops, although enhances consumers' utility from purchasing either brand of packaged ground coffee product, has a bigger positive impact on Starbucks packaged ground coffee product. This in fact disadvantages Folgers during its competition with Starbucks for type-L consumers and reduces its price. Therefore, the total effect of Starbucks café shops on the price of Folgers is a mix of its positive effect in the segment of type-H consumers, and its negative effect in the segment of type-L consumers. The sign of the total effect depends on the proportions of these two types of consumers: the positive effect dominates when $\alpha > \alpha^*$, otherwise the negative effect dominates.

Comparative statics of equilibrium quantities

We now analyze the effect of Starbucks café shops on the equilibrium quantities of the two brands of packaged ground coffee products sold in grocery stores. As discussed in the model setup, Starbucks café shops have two effects: "business stealing effect" which reduces $m(N_S)$, the number of consumers who buy packaged ground coffee from grocery stores, and "market expanding effect" which shifts consumers' preferences for the two packaged ground coffee products. Both effects can play a role in deciding the equilibrium sales of the two products. In order to separate these two effects, we rewrite the demand functions in equation (10) and (11) to be

$$Q_S = m(N_S)Q_S^0 \tag{22}$$

$$Q_F = m(N_S)Q_F^0 \tag{23}$$

where $m(N_S)$ is the total population of packaged ground coffee shoppers. Among these consumers, the proportion of buyers for Starbucks and Folgers are respectively :

$$\begin{aligned} Q_S^0 &\equiv \alpha x_1^* + (1-\alpha)x_1^{**} \\ &= \alpha\left(\frac{v_0+(1+\theta)v(N_S)-p_S}{t_H}\right) + (1-\alpha)\left(\frac{\theta v(N_S)-p_S+p_F}{2t_L}+\frac{1}{2}\right) \end{aligned} \tag{24}$$

and

$$\begin{aligned} Q_F^0 &\equiv \alpha(1-x_2^*) + (1-\alpha)(1-x_1^{**}) \\ &= \alpha\left(\frac{v_0+v(N_S)-p_F}{t_H}\right) + (1-\alpha)\left(\frac{-\theta v(N_S)+p_S-p_F}{2t_L}+\frac{1}{2}\right) \end{aligned} \tag{25}$$

Under the equilibrium prices $\{p_S^*, p_F^*\}$ shown in equation (16) and (17), one can check that:

$$\partial\frac{Q_S^0(p_S^*,p_F^*)}{\partial N_S}=(z+w)\frac{\Delta_1}{\Delta_0}v'(N_S) \tag{26}$$

$$\partial\frac{Q_F^0(p_S^*,p_F^*)}{\partial N_S}=(z+w)\frac{\Delta_2}{\Delta_0}v'(N_S) \tag{27}$$

This suggests $\partial\frac{Q_S^0(p_S^*,p_F^*)}{\partial N_S}$ is always positive, while the sign of $\partial\frac{Q_F^0(p_S^*,p_F^*)}{\partial N_S}$ depends on the value of α: $\partial\frac{Q_F^0(p_S^*,p_F^*)}{\partial N_S}>0$ if $\alpha>\alpha^*$, and $\partial\frac{Q_F^0(p_S^*,p_F^*)}{\partial N_S}<0$ otherwise. Therefore, the impacts of Starbucks café shops on Q_S and Q_F are as follows:

$$\partial\frac{Q_S(p_S^*,p_F^*)}{\partial N_S}=\underbrace{m'(N_S)Q_S^0}_{(-)}+\underbrace{m(N_S)\partial\frac{Q_S^0(p_S^*,p_F^*)}{\partial N_S}}_{(+)} \tag{28}$$

$$\partial\frac{Q_F(p_S^*,p_F^*)}{\partial N_S}=\underbrace{m'(N_S)Q_F^0}_{(-)}+\underbrace{m(N_S)\partial\frac{Q_F^0(p_S^*,p_F^*)}{\partial N_S}}_{(+)\ or\ (-)} \tag{29}$$

With the coexistence of "business stealing effect" and "market expanding effect", the number of Starbucks café shops has an ambiguous effect on the sales of both brands of packaged ground coffee products in grocery stores. The only exception is the case when $\alpha<\alpha^*$, in which the impact on the sales of Folgers is negative for sure.

We conclude the theoretical analysis by summarizing above comparative statics in Proposition 1.

Proposition 1. Denote $\{p_S^*,p_F^*\}$ and $\{Q_S(p_S^*,p_F^*),Q_F(p_S^*,p_F^*)\}$ as the equilibrium prices and quantities of Starbucks and Folgers packaged ground coffee products sold in grocery stores. Let $\alpha^*\in(0,1)$ be the unique solution for, $2z^2+zw(3-\theta)-w^2\theta=0$, in which $z\equiv\frac{\alpha}{t_H}$ and $w\equiv\frac{1-\alpha}{2t_L}$. When the number of Starbucks café shops, N_S, increases, the following statements hold:

(1) For Starbucks, p_S^* increases for sure, while $Q_S(p_S^*,p_F^*)$ changes ambiguously.

(2) For Folgers:

(2.a) If the proportion of type-H consumers satisfies $\alpha>\alpha^*$: p_F^* increases for sure and $Q_F(p_S^*,p_F^*)$ changes ambiguously.

(2.b) If the proportion of type-H consumers satisfies $\alpha<\alpha^*$: both p_F^* and $Q_F(p_S^*,p_F^*)$ decrease for sure.

Proposition 1 shows that an increase of Starbucks café shops in a market could have ambiguous impacts on the equilibrium prices and quantities of packaged ground coffee products of Starbucks and its competitor in retail grocery stores. This calls for an empirical study to investigate that the sign of the impact in real-world markets. We undertake such an empirical study throughout subsequent sections of the paper.

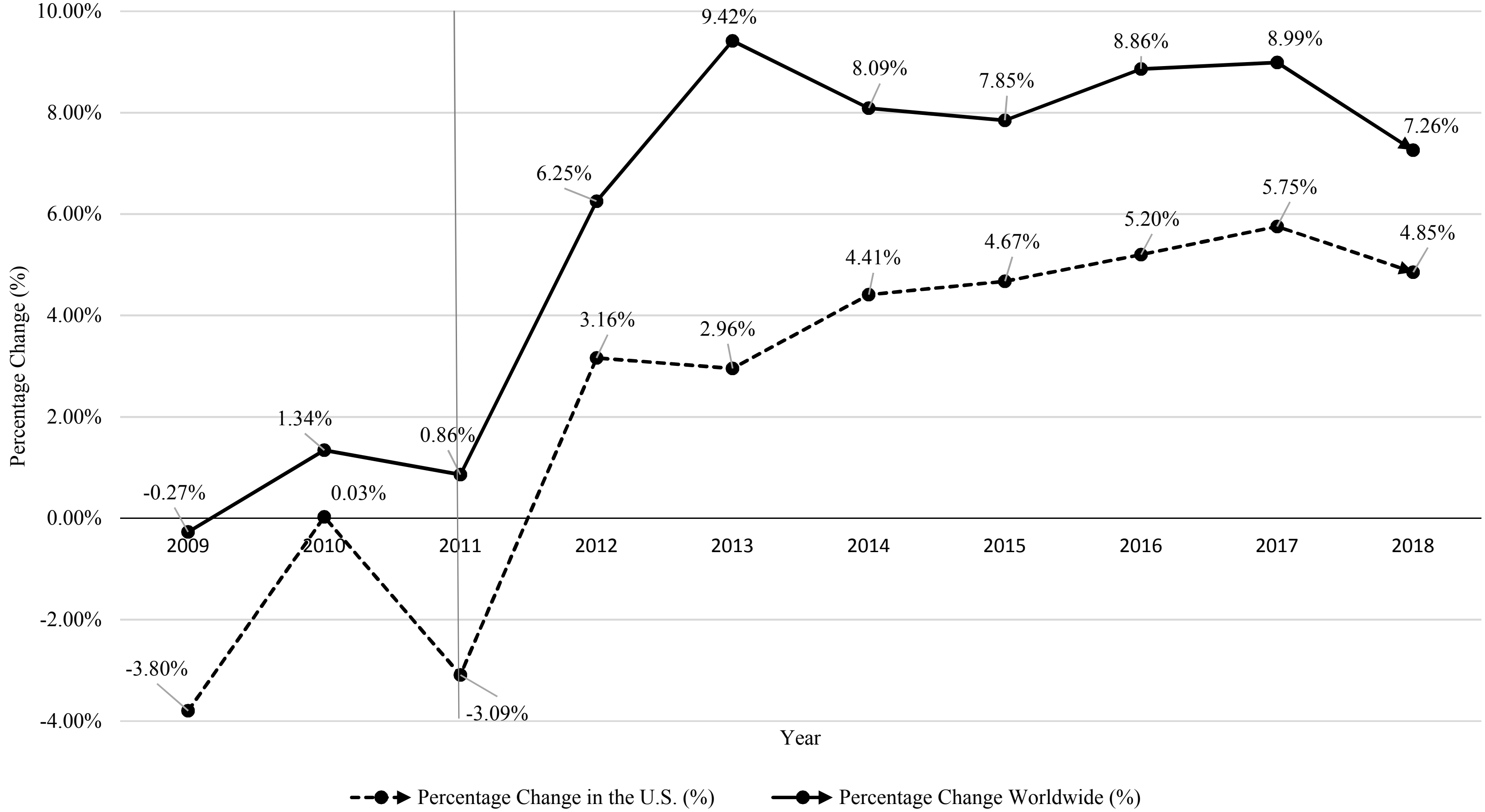
4. The Data

We focus our empirical analysis on the U.S. coffee market in the year 2012. There are two reasons why 2012 is the year we choose to study. First, it is the year that Starbucks café shops started expansion quickly since the 2008 recession. We obtain the Starbucks café shop counts in the U.S. and abroad from the company's annual reports from 2009 to 2018. Figure 2 plots the percent changes in the number of Starbucks café shops in the U.S. and worldwide in these years. In 2010, Starbucks café shop count slowly started recovery from the massive café closures between 2008 and 2009, with more than 600 cafés being closed nationwide.[3] However, both the domestic and global growth rates in the presence of Starbucks café shops experienced vast rebound by 3.16% in the U.S. and 6.25% worldwide from 2011 to 2012; and since then, Starbucks continues to sustain a moderate pace in terms of café shop presence expansions nationwide. The year 2012 is thus an important transition year in which the presence of Starbucks café shops started quick expansions.

The second reason for using the year 2012 is more decisive as the location data of Starbucks café shops in the U.S. is only available in 2012. The café shop location data is obtained from AggData, a marketing firm which provides business locational data. The café shop location data contain information about the complete café addresses including zip codes and states, business hours, and in-store wireless status. We delineate the geographical boundaries of a market based on zip code. To measure the presence of Starbucks café shops in a market, we create a variable, *N Café Shops*, that counts the café shops located within the market zip code that are owned or franchised by the Starbucks company.

[3] Numbers are calculated based on Starbucks annual reports. https://investor.starbucks.com/financial-data/annual-reports/default.aspx

Figure 2: Percentage Change of Starbucks' Store Counts in the U.S. and Worldwide, 2009 - 2018



The grocery store[4] packaged ground coffee product information is sourced from the Information Resources Inc. (IRI) academic database [Bronnenberg et al. (2008)], which spans 1725 supermarkets and drug stores across 50 IRI defined geographical areas and 1472 zip code areas in the continental United States. It is a retail-level scanner data on consumer purchases of traditional auto-drip ground coffee products[5] that are packed in bulk in either bags or canisters. The 50 IRI defined geographical areas span almost the entire continental US. In this study, markets are defined by unique combinations of time periods and zip codes. The data include weekly coffee product unit sales, revenue from these unit sales, and various characteristics of the coffee products. Detailed information for each weekly observation includes: total dollars received by grocery stores from the sales of each packaged ground coffee product; unit of packages sold; net weight of total dry coffee grounds (in ounces) contained in each package[6], and other product attributes such as packaging information;[7] organic features;[8] caffeine description;[9] and promotional activities[10]. A product within a market is defined as a unique combination of brand name, and non-price product attributes, which include the particular grocery store where the product is sold.

The weekly observations are then aggregated to monthly data based on defined products and markets. In order to collapse the weekly observations to monthly, we create the price and quantity variables for defined products. Following previous studies on the coffee industry [Villas-Boas (2007a, 2007b), Leibtag et al. (2007), Nakamura and Zerom (2010), Bonnet et al. (2013), Bonnet and Villas-Boas (2016)], the measure of coffee demand/consumption is in terms of mass

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[4] Retailers of the packaged ground coffee product in our data are supermarkets and drug stores, even though we generically refer to these retailers as "grocery stores" throughout the paper.

[5] We focus on two coffee categories according to the coffee classifications in the IRI data: regular caffeinated ground coffee and decaffeinated ground coffee. One reason that we select the two coffee categories because the consumption method of the two coffee types are same, i.e. using the traditional auto-drip coffee makers and brewing directly from the coffee grounds in the package. Another reason is that these two coffee types account for more than 60% of total coffee products provided by Starbucks in the product sales data. All other categories are characterized into "others" including: instant, whole bean, single-cup coffee pods, instant decaffeinated, and other coffee substitutes. As you will observe later, once we have described the demand model, the "others" category constitutes the "outside" option for consumer choice.

[6] The mass weight of coffee grounds contained in an individual package range from 6 ounces to 48 ounces.

[7] Product packages for ground coffee including laminated bags (e.g. foil bags or film bags), plastic containers, and light metal tins. (https://plastics.americanchemistry.com/LCI-Summary-for-8-Coffee-Packaging-Systems/)

[8] All observations due to coding error are removed. Observations with missing organic information are supplemented with information provided by online sources (if they are able to be identified from online resources). All other un-identified observations from any available resources are eliminated.

[9] Caffeine information in the data is described as "Regular", "20% More Caffeine", "40% More Caffeine", "50% Decaffeinated", "97% Caffeine Free", and so on. We consider these descriptions are relative to regular ground coffee caffeine level according to USDA report: "Basic Report: 14209, Coffee, brewed from grounds, prepared with tap water".

[10] These data contain information related to promotional activities such as feature, display, and temporary price cut.

weight of dry coffee grounds in ounces. For each weekly observation in the data, we have information on total dollars received by the grocery store for multiple packages sold during a week, the number of packages as well as the net weight (in ounces) of coffee grounds in a package. To construct the price and quantity variables, we first compute the total ounces of coffee grounds sold in each week by multiplying the net weight of coffee grounds in a package with the number of packages sold in a week. We then calculate the weekly average price for each weekly product observation using the ratio of total dollars from sales to total ounces of coffee grounds sold in a week. When collapsing the data to monthly frequency, the "*price*" variable for a product is the mean of those weekly average prices for a product sold during a month, and the "*quantity*" variable for a product is the sum of total ounces of coffee grounds sold in a month. The monthly aggregation reduces the 4.9 million weekly observations to 1.4 million monthly observations. Each observation is a uniquely defined product. Finally, with 12 months and 1472 distinct zip codes, we have 17,228 markets in total.

Within the framework of a discrete choice demand model, to calculate the market share of each product in a market that allows for outside goods option, one needs a measure of potential market size that is larger than the actual aggregate consumption of products in the market. Potential market size (later denoted M_t) is computed as the total ounces of coffee grounds that could be consumed in a market during a month if all adult males and females in a market consumed coffee at the typical per capita consumption rates for males and females respectively.[11] The observed product share (later denoted S_{jt}) is computed by dividing the quantity sold of a product by the above defined potential market size, while the share of the outside goods option, denoted as S_{0t}, is computed as $S_{0t} = 1 - \sum_{j \epsilon J} S_{jt}$, where J represents the set of coffee products in market

[11] Based on the National Coffee Association (NCA) survey in 2016, we calculate the total ounces of brewed coffee consumed by a female and a male per month respectively. On average, a female drinks 1.85 cups per day and a male drinks 2.11 cups per day, with each standard cup being 10 fl oz. To convert the brewed coffee to equivalent coffee grounds in ounces, we apply a universal serving size of 0.317 oz coffee grounds per standard 10 fl oz cup of coffee. NCA suggests a coffee-water ratio, that is one to two tablespoons of ground coffee for every six fluid ounces of water. (http://www.ncausa.org/About-Coffee/How-to-Brew-Coffee). The two largest ground coffee brands, Folgers and Maxwell House, both suggest a recipe of one tablespoon ground coffee (about 0.19 ounces) per six fluid ounces of water for regular strength, and two tablespoon ground coffee (about 0.38 ounces) per six fluid ounces of water for strong coffee. (https://www.folgerscoffee.com/coffee-how-to/how-to-measure-coffee) We consider an average coffee drinker follows a regular strength brewed coffee recipe, i.e. 0.0317 oz ground coffee makes 1 fl oz brewed coffee. The female and male adult populations in a market are obtained from the American Community Survey estimates in 2012. (https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_DP05&src=pt)

t of our data. The outside good share is a measure of the proportion of the potential market size who did not consume any of the J coffee products in market t.

The summary statistics of price, quantity and market size are presented in Table 1. In the collapsed dataset, there are 1,367,962 unique products sold in 17,228 markets according to our product and market definitions. These ground coffee products sold in 2012 have an average coffee price of 51.5¢ per oz, with a mean monthly product quantity sold in a market of 286 oz. The measure of potential market sizes described above yields a mean of product shares equal to 0.001 and the mean market share of outside options of 0.908.

We then construct some product characteristics variables reported in Table 1. To evaluate consumer brand preference between Starbucks ground coffee products and non-Starbucks ground coffee products, we create a Starbucks dummy variable, which equals to 1 if the ground coffee product is produced by Starbucks company and 0 if the product is produced by any other non-Starbucks coffee manufacturer. In Table 1, it shows that 8.5% of ground coffee products in the data are produced by Starbucks.

The aforementioned presence intensity measure of Starbucks café shops in a market, *N Café Shop*, suggests, on average, each market has 0.727 Starbucks café shop. The detailed distribution of Starbucks café shop presence across markets is presented in Table 2. Among the 17,228 markets, more than 61% have at least 1 Starbucks café shop operating in the market, and 10,141 of these markets have 1 Starbucks café shop located across 875 zip code areas with more than a thousand grocery stores selling packaged ground coffee products. 6,626 markets in our sample have no Starbucks café shop. These markets are located across 568 zip code areas with 632 grocery stores. Markets with a high presence of Starbucks café shops, i.e. markets with 3 and 4 café shops, are concentrated in a few zip code areas12 that are close to large metropolitan cities.

According to the caffeine level descriptions in the data, we create the *Caffeine* variable to describe the caffeine content of each retailed packaged coffee product. Caffeine content is measured in gram per ounce of dry coffee grounds and is approximated using information from USDA National Nutrient Database for Standard Reference Release 27. On average, 0.61 grams of dry ground coffee contains 40 mg caffeine, or equivalently, 1.86 grams of caffeine per ounce of dry coffee. For example, for a coffee product with "20% More Caffeine" in the data, the caffeine

[12] The 8 zip code areas include Glendale (NY), Liverpool (NY), Gastonia (NC), Marietta (GA), Winfield (IN), Eau Claire (WI), O'Fallon (MO).

content of this product is computed by multiplying 1.86 with (1+20%). If a coffee product has "97% Caffeine Free", the product's caffeine content is obtained by multiplying 1.86 with (1-97%). Any products labeled as "Caffeine Free" or "Decaffeinated" are assumed to be 99.9% caffeine free to meet the USDA product labeling requirements for caffeine free or decaffeinated products, i.e. caffeine content should not exceed 0.1%.[13] Table 1 shows the caffeine content for a typical coffee product is 1.68 grams per ounce of dry coffee grounds. Caffeine is a major pharmacologically active compound in coffee beans, and it is a mild central nervous system stimulant [de Mejia and Ramirez-Mares (2014)]. Coffee, like other caffeinated soft drinks, acts as a stimulant beverage. As such, we expect a positive impact of caffeine content on consumer demand.

Many studies analyze the extent to which marketing strategies used by retailers, such as whether the product is featured in store, specially displayed in store, and/or has a temporary retail price cut, affect consumer brand choice and brand loyalty [Hwang and Thomadsen (2017), Bronnenberg et al. (2012) and Boatwright, Dhar and Rossi (2004)]. To capture the potential impact of retailer marketing activities on consumer demand, we construct a variable, *Marketing Intensity*, which counts the total number of weeks in a month that a product is on feature, display, and has a temporary price cut. The summary statistics in Table 1 shows that, on average, the typical product is promoted 1.036 weeks within a month.[14] The maximum value of *Marketing Intensity* suggests a product is advertised every week with all the above three events. We expect a positive effect of promotional activities on consumer demand, i.e. the more frequently advertised a product is, the higher demand for the product is likely to be.

We consider the demand impact of package size, which is captured by the dummy variable, *Large*, equal to 1 if a product has a net weight of coffee grounds in a package greater than the standard package size of 16 oz [Guadagni and Little (1998); and Ansari, Bawa, and Ghosh (1995)], 0 otherwise. The demand model coefficient estimate on dummy variable, *Large*, is expected to be positive according to the similar estimate in previous literature.

In terms of the organic feature of packaged ground coffee products in the data, we find only 2.5% of observations are organic. Consumers normally show varying tastes between organic and non-organic food and beverage items. To capture the potential impact that the organic feature of coffee products has on consumer demand, we create a dummy variable, *Organic*, equal to 1 if

[13] https://www.ams.usda.gov/sites/default/files/media/CID%20Coffee.pdf
[14] Coffee is one of the most frequently promoted consumer packaged goods (CPGs) (Boatwright et al. (2004)).

a product is organic coffee and 0 otherwise. As Table 1 reveals, the majority of coffee products in the data sample are non-organic.

Table 1: Summary Statistics

Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Price ($/oz)	0.515	0.202	0.00029	2.148
Quantity (oz)	286.032	694.081	6	71886.15
Starbucks Dummy (1 if products belong to Starbucks)	0.085	0.279	0	1
Number of Starbucks café shops in the market (*N Café Shops*)	0.727	0.627	0	4
Caffeine (gram per ounce)	1.498	0.7	0.00186	2.232
Marketing Intensity (No. of weeks per month a product was promoted)	1.036	1.401	0	15
Large package dummy (>16 ounces in a package=1)	0.301	0.459	0	1
Organic dummy (organic coffee products = 1)	0.025	0.157	0	1
Product market shares (all inside goods)	0.001	0.002	0.000004	0.200093
Market shares of outside goods	0.908	0.095	0.018020	0.999989
No. of zip code areas	1,472[15]			
No. of grocery stores	1,725			
No. of manufacturers	206[16]			
No. of brands	253			
No. of defined markets	17,228			
No. of defined products	1,367,962			

* All prices are adjusted to 2012 dollars.

Table 2: Summary Statistics of Starbucks Café Shops Presence

N Café Shops	**NO. of Markets**	**NO. of Zip Codes**	**NO. of Grocery Stores**	**NO. of Products**
NONE	6,626	568	632	471,157
1 Café Shop	10,141	875	1,013	825,928
2 Café Shops	377	35	70	51,253
3 Café Shops	54	5	16	12,013
4 Café Shops	30	3	14	7,611
Total	17,228	1,472	1,725	1,367,962

[15] Among the total 1,472 zip code areas in the data, 1,275 have only 1 retail store (monopoly), 376 have 2 retailer stores (duopoly), 54 have 3 retail stores, 32 have 4 retail stores, and 6 have 6 retail stores. Thus, the majority geographical locations at zip code level are monopoly markets with only one retailer.

[16] Among the total 206 coffee manufacturers, 180 have only 1 coffee brand sold in retail stores, 15 have 2 coffee brands, 6 have 3 coffee brands, 3 have 4 coffee brands, 1 have 5 coffee brands (THE REILY COMPANIES), 1 have 10 coffee brands (THE J M SMUCKER CO). Starbucks company has two brands: SEATTLES BEST COFFEE and STARBUCKS.

There are 206 coffee manufacturers and 253 brands in the data sample. It will be too large of a table to report summary statistics by all coffee manufacturers. Therefore, for the data reported in Table 3, we select eleven coffee manufacturers that have the largest shares of total revenue (>1%) during the sample period. The total market share (in dollar value) of the select coffee manufacturers is 95% in 2012. Table 3 presents summary revenue information of the eleven firms. The top three firms control 73% of market share in coffee dollar sales in 2012. The largest coffee manufacturer is THE JM SMUCKER CO, with the largest total ground coffee revenue share of 39% during 2012. THE JM SMUCKER CO owns ten coffee brands and the largest two brands are FOLGERS and DUNKIN DONUTS, contributing 93% of total sales of this firm. KRAFT FOODS GROUP INC is the second largest firm in terms of total coffee dollar sales, with 21% total industry coffee sales in 2012. Three coffee brands belong to KRAFT FOODS GROUP INC. 77% of its total coffee sales are generated by the MAXWELL HOUSE brand. Among all the select coffee manufacturers reported in Table 3, STARBUCKS COFFEE CO is the third largest one, contributing 13% of the total industry coffee sales in 2012. 86% of its revenue in 2012 comes from the sales of packaged ground coffee products under the brand name of STARBUCKS, and the remaining 14% from the sales of packaged ground coffee products under the brand name of SEATTLES BEST COFFEE, which was acquired by STARBUCKS COFFEE CO in 2003.

Table 3: Coffee Dollar Sales for Select Coffee Manufacturers in 2012

MANUFACTURERS	Total Dollar Sales	% of Total Industry Coffee Dollar Sales
THE J M SMUCKER CO	$61,500,000	39%
KRAFT FOODS GROUP INC	$33,100,000	21%
STARBUCKS COFFEE CO	$20,900,000	13%
MASSIMO ZANETTI BEVERAGE USA	$7,735,691	5%
JOH A BENCKISER (JAB)	$7,667,350	5%
THE REILY COMPANIES	$4,572,632	3%
TATA TEA LTD	$4,543,684	3%
KEURIG GREEN MOUNTAIN	$3,386,019	2%
F GAVINA & SONS INC	$2,570,547	2%
MELITTA WERKE BINTZ & SOHN	$2,261,956	1%
COMMUNITY COFFEE CO INC	$1,738,479	1%
TOTAL	$157,884,088.82	95%

The Top Three Coffee Manufacturers' Coffee Dollar Sales, by Brands

MANUFACTURERS	BRANDS	% of Total Firm Coffee Dollar Sales
THE J M SMUCKER CO	FOLGERS	73.33%
	DUNKIN DONUTS	19.35%
	CAFE BUSTELO	4.62%
	MILLSTONE	1.47%
	MEDAGLIA D ORO	0.48%
	CAFE PILON	0.43%
	EL PICO	0.14%
	MARYLAND CLUB	0.13%
	BROTHERS	0.02%
	DOUWE EGBERTS	0.0004%
KRAFT FOODS GROUP INC	MAXWELL HOUSE	77%
	GEVALIA	12%
	YUBAN	11%
STARBUCKS COFFEE CO	STARBUCKS	86%
	SEATTLES BEST COFFEE	14%

5. The Empirical Model

In this section, we outline the analytical framework used to perform the empirical analysis. The analytical framework is to first estimate the structural parameters that govern the market demand and supply of the packaged ground coffee products sold in grocery stores (in our data set these are supermarkets and drug stores), and then use the estimated structural parameters to simulate new market equilibrium outcomes based on an assumed counterfactual change in the presence of Starbucks café shops in the relevant market. The counterfactual experiment is designed to assess how much the sales and profitability of retail packaged ground coffee products in a market are influenced by a marginal change in the number of existing Starbucks café shops in the market. Specifically, we counterfactually increase the number of existing Starbucks café shops in the markets by one, i.e. *N Café Shops*$+1$. In other words, we are interested to understand the market equilibrium outcomes if there is a marginal increase in the presence intensity of Starbucks café shops.

5.1 Demand

We model consumers' coffee product choices with a nested logit demand model. Suppose there are T distinct markets for retail packaged ground coffee products, and markets are indexed by $t = 1, \dots, T$. Each market is populated with I_t potential coffee consumers, and consumers are indexed by $i = 1, \dots, I_t$. Consumers in each market are faced with J_t distinct coffee products in our data sample. Therefore, in each market consumers are effectively faced with $J_t + 1$ alternatives, which are indexed by $j = 0, 1, \dots, J_t$. Where $j = 0$ represents consumers' outside option of not purchasing one of the packaged ground coffee products in our data sample. In our analysis, consumers' outside option is a composite of several possibilities such as buying other coffee substitutes (e.g. instant coffee, whole bean coffee, single-cup coffee, ready-to-drink coffee beverages, etc.) or simply not buying. The nested logit model classifies coffee products into G groups, and one additional group for the outside option. Therefore, products are organized into $G + 1$ mutually exclusive groups. We group coffee products by coffee manufacturers. A consumer solves the following utility maximization problem:

$$\underset{j \in \{0,1,\dots,J_t\}}{Max} \; U_{ijt} = \delta_{jt} + \sigma\zeta_{igt} + (1-\sigma)\varepsilon_{ijt} \tag{30}$$

$$\delta_{jt} = x_{jt}\beta + \alpha p_{jt} + \gamma_1 N\ Caf\acute{e}\ Shops_t +$$

$$\gamma_2 Starbucks\ Dummy_{jt} \times N\ Café\ Shops_t + a_t + a_b + \xi_{jt} \quad (31)$$

where

- δ_{jt} is the mean level of utility across consumers that choose product j.
- ζ_{igt} is a random component of utility common across all products within the same group.
- ε_{ijt} is an independently and identically distributed (across products, consumers, and markets) random error term assumed to have an extreme value distribution.
- x_{jt} is a vector of K observed product characteristics that vary across products and markets.
- p_{jt} is the price of the product j.
- $Starbucks\ Dummy_{jt}$ is a zero-one dummy variable that equals to one only if product j is owned by Starbucks, and zero if product j belongs to all other coffee manufacturers.
- $N\ Café\ Shops_t$ is the number of Starbucks café shops in market t.
- a_t, a_b are the time and brand fixed effects respectively[17].
- ξ_{jt} is unobserved (by the researchers) component of product characteristics that affect consumer utility.

The vector x_{jt} includes: (*i*) *Caffeine*, the caffeine content measured by gram per ounce of dry coffee grounds for product j; (*ii*) *Marketing Intensity*, is a measure of how frequent a product is advertised or promoted and it counts the total number of weeks in a month that a product is on feature, display, and has a temporary price cut; (*iii*) *Large*, equals to 1 if a product has a net weight of coffee grounds in a package greater than the standard package size of 16 ounces [Guadagni and Little (1998); and Ansari, Bawa and Ghosh (1995)], 0 otherwise; (*iv*) *Organic*, equals to 1 if a product is organic coffee and 0 otherwise. The vector of parameters, β, measures the consumer i's marginal utilities associated with the above non-price product characteristics. The parameter α captures the marginal disutility of price.

[17] For this demand specification, we do not consider the zip code area fixed effects and the retail store fixed effects. We find 1275 out of the total 1472 zip code locations in the data have only 1 retail store. Therefore, the store-specific shocks to consumer preferences for coffee products can potentially be explained by simply the zip code area fixed effects. However, the Starbucks café shops presence variable, *N Café Shops*, to some extent, introduces zip code level variations that affect consumer coffee demand. We, therefore, ignore the fixed effects at the zip code level and the retailer level.

To evaluate the potential impact of the presence of Starbucks café shops on the consumer demand for the packaged ground coffee products sold in the grocery stores in a market, we include a variable that counts the number of café shops owned or franchised by Starbucks company, *N Café Shops*. The parameter γ_1 measures the impact on consumer demand for packaged ground coffee products of all the non-Starbucks coffee brands sold in grocery stores in a market associated with the presence of Starbucks café shops in the market.

We include an interaction term between the number of Starbucks café shops, *N Café Shops*, and the dummy variable, *Starbucks Dummy*, to evaluate the potential impact of the presence of café shops owned and franchised by Starbucks company on the consumer demand for the Starbucks brand retail packaged ground coffee products relative to the impact on consumer demand for competing non-Starbucks brand packaged ground coffee products. This relative impact on consumer coffee demand associated with the presence of Starbucks café shops in the market is measured by the parameter γ_2. How much the presence of Starbucks café shops influences consumer demand for its own brand packaged ground coffee products in the retailing sector is captured by the sum of parameter estimates γ_1 and γ_2.

The parameter σ lies between 0 and 1 and measures the correlation of consumer utility across products belonging to the same coffee manufacturer. The correlation of consumer preferences increases as σ approaches 1. In the case when σ is 0, the demand model collapse to the standard logit demand model where products complete symmetrically. For notational convenience, we drop the market subscripts to complete the derivation of the model.

Suppose there are G_g products in group g. If product j is in group g, then the conditional probability of consumer choosing product j given that group g is chosen is given by:

$$s_{j/g} = \frac{e^{\frac{\delta_j}{1-\sigma}}}{D_g}; \qquad D_g = \sum_{j \in G_g} e^{\frac{\delta_j}{1-\sigma}} \tag{32}$$

The probability of consumer choosing group g, or group g's predicted share, is given by:

$$s_g = \frac{D_g^{1-\sigma}}{D_0^{1-\sigma} + \sum_{g=1}^{G} D_g^{1-\sigma}} \tag{33}$$

The outside option is the only good in group 0. Therefore, $D_0^{1-\sigma} = e^{\delta_0}$. We normalize the mean utility obtained from the outside option to zero, which implies $D_0^{1-\sigma} = 1$. The above equation (33) can be rewritten as:

$$s_g = \frac{D_g^{1-\sigma}}{1+\sum_{g=1}^{G} D_g^{1-\sigma}} \tag{34}$$

The unconditional probability of choosing product j, or the predicted market share of product j is:

$$s_j = s_{j/g} \times s_g = \frac{e^{\frac{\delta_j}{1-\sigma}}}{D_g} \times \frac{D_g^{1-\sigma}}{1+\sum_{g=1}^{G} D_g^{1-\sigma}} = \frac{e^{\frac{\delta_j}{1-\sigma}}}{D_g^{\delta}[1+\sum_{g=1}^{G} D_g^{1-\sigma}]} \tag{35}$$

Therefore, the demand for product j is given by:

$$d_{jt} = M_t \times s_{jt}(\boldsymbol{x}, \boldsymbol{p}, \xi_{jt}; \beta, \alpha, \gamma_1, \gamma_2, \sigma) \tag{36}$$

Where $\boldsymbol{x}$ here represents a vector of all the observed non-price characteristics including variables *N Café Shops* and the interaction between *Starbucks Dummy* and *N Café Shops*. The potential market size measure, M_t, as previously described, is the total ounces of ground coffee that could be consumed in a market during a month if all adult males and females in the market consumed coffee at the typical per capita consumption rates for males and females respectively. Last, $s_{jt}(\boldsymbol{x}, \boldsymbol{p}, \xi_{jt}; \beta, \alpha, \gamma_1, \gamma_2, \sigma)$ represents the *predicted* market share function of product *j* described in equation (35).

5.2 Supply

The supply side of our structural econometric model can be designed to capture both the horizontal and vertical relationships between coffee manufacturers and grocery retailers [Bonnet and Dubois (2010); Bonnet et.al. (2013); and Bonnet and Villas-Boas (2016)]. However, in this paper, it is not our focus to explore which supply model best represents the vertical structure of the US coffee industry. Instead, we make the simplifying assumption that grocery retailers do not play a strategic role in setting retail prices of the packaged ground coffee products in our analysis, and simply set retail prices just high enough to cover their economic retailing costs and costs to obtain coffee products from coffee manufacturers. We do assume coffee manufacturers play a strategic role in setting prices of their packaged ground coffee products to non-cooperatively maximize firm-level profit. As such, we consider a supply model of the coffee industry in which coffee manufacturers effectively determine packaged ground coffee product prices according to a static Nash equilibrium price-setting game.

Suppose each coffee manufacturer f offers a set of packaged ground coffee products in market t, F_{ft}, and sets the prices of these products to maximize the firm's variable profit:

$$\max_{p_{jt}\forall j\in F_{ft}} VP_{ft} = \max_{p_{jt}\forall j\in F_{ft}} \sum_{j\in F_{ft}} \left(p_{jt} - mc_{jt}\right) q_{jt} \tag{37}$$

where in equilibrium the quantity of coffee product j that gets sold in market t, q_{jt}, is exactly equal to the market demand of this product, i.e. $q_{jt} = M_t \times s_{jt}(\boldsymbol{p})$. Recall that M_t is a measure of potential market size; $s_{jt}(\boldsymbol{p})$ is the *predicted* market share function for product j; and $\boldsymbol{p}$ is a vector of the prices for the J products in market t. Last, mc_{jt} represents the marginal cost incurred by the firm to provide product j in market t.

The first-order conditions generated from the optimization problem in equation (37) for all competing firms are a set of J equations, one for each product. Following expositions in Nevo (2000), the set of J first-order conditions imply the following product markup equation expressed in matrix notation:

$$\boldsymbol{mkup}\left(\boldsymbol{x}, \boldsymbol{p}, \boldsymbol{\xi}; \hat{\beta}, \hat{\phi}, \hat{\alpha}, \hat{\Gamma}, \hat{\Sigma}\right) \equiv \boldsymbol{p} - \boldsymbol{mc} = -(\boldsymbol{\Omega} * \boldsymbol{\Delta})^{-1} \times \boldsymbol{s}(\boldsymbol{p}) \tag{38}$$

where $\boldsymbol{s}(\cdot), \boldsymbol{p}, \boldsymbol{mc}$ are $J \times 1$ vectors of product shares, prices, and marginal costs, respectively; $\boldsymbol{\Omega}$ is a $J \times J$ matrix of appropriately positioned zeros and ones based on the manufacturers' ownership structure of the J products; $\boldsymbol{\Delta}$ is a $J \times J$ matrix of first-order derivatives of predicted product shares with respect to prices; and $\boldsymbol{\Omega} * \boldsymbol{\Delta}$ is an element-by-element multiplication of the two matrices. Equation (38) above also implies product-level markup estimates, which depend exclusively on the demand-side variables and parameter estimates. Using computed product-level markups and product prices, product-level marginal cost estimates can be recovered as follows:

$$\widehat{\boldsymbol{mc}} = \boldsymbol{p} - [-(\boldsymbol{\Omega} * \boldsymbol{\Delta})^{-1} \boldsymbol{s}(\boldsymbol{p})] \tag{39}$$

Last, with the estimated markups given by equation (38), manufacturers' variable profits can be computed using:

$$\widehat{VP}_{jt} = \sum_{j\in F_{ft}} mkup_{jt}(\boldsymbol{x}, \boldsymbol{p}, \boldsymbol{\xi}; \hat{\beta}, \hat{\phi}, \hat{\alpha}, \hat{\Gamma}, \hat{\Sigma}) \times M_t \times s_{jt}\left(\boldsymbol{x}, \boldsymbol{p}, \boldsymbol{\xi}; \hat{\beta}, \hat{\phi}, \hat{\alpha}, \hat{\Gamma}, \hat{\Sigma}\right) \tag{40}$$

5.3 Estimation and Identification of Demand

The estimation strategy of the demand parameters $(\beta, \alpha, \gamma_1, \gamma_2, \sigma)$ is such that the observed market shares, S_{jt}, are equal to the predicted market shares, s_{jt}. Following the linear transformation method in Berry (1994), the demand model presented above can be transformed to the following linear equation:

$$ln(S_{jt}) - ln(S_{0t}) = x_{jt}\beta + \alpha p_{jt} + \gamma_1 N\ Caf\acute{e}\ Shops_t + \gamma_2 Starbucks\ Dummy_{jt} \times N\ Caf\acute{e}\ Shops_t + \sigma ln(S_{j/g}) + a_t + a_b + \xi_{jt} \quad (41)$$

where S_{jt} is the observed market share of product j computed from the data using $S_{jt} = \frac{q_{jt}}{M_t}$, and q_{jt} is the quantity of packaged ground coffee product j sold. $S_{0t} = 1 - \sum_{j \in J_t} S_{jt}$ is the observed market share of the outside good. $S_{j/g}$ is the observed within-group share of product j. The other variables are described previously. Equation (41) is estimated using the Two-Stage Least Squares (2SLS) given by the fact that price, p_{jt}, and within-group share, $ln(S_{j/g})$, are endogenous for the nested logit demand as discussed in Berry (1994). In addition, we consider Starbucks's café shop location choices are likely to be correlated with the unobserved market-specific characteristics that affect consumer demand. Therefore, we take the variable that measures the presence of Starbucks café shops as well as its interaction term with Starbucks dummy as endogenous variables.

Instruments

Obtaining consistent demand parameter estimates relies heavily on the selection of instrument variables for the endogenous product prices, the log of within-group product shares and the presence variable of Starbucks café shops. Consumers make purchase decisions among different coffee products, where a product is perceived as a bundle of product attributes. Product attributes unobserved by researchers, which are contained in ξ_{jt}, are likely correlated with prices and within-group product shares. Hence, it is important to select appropriate instrument variables for prices and within-group product shares. One way to cope with the endogeneity of prices is to account for fixed differences in ξ_{jt} in a flexible manner by introducing dummy variables [Nevo (2001)]. These dummies control for constant differences in consumer utility across products in the mean utility of products. As such, to help mitigate the endogeneity problem we include in the mean utility function time dummies (a_t) and brand dummies (a_b) to account for some product characteristics in ξ_{jt}.

To further mitigate the endogeneity problem, we construct instruments for product prices using direct components of marginal cost as well as product markups that affect product prices according to Berry (1994). The first set of instruments for the price, we interact the national average electricity prices[18] with dummy variables for three different packaging materials for coffee products. The packaging materials are: (1) laminated (foil) bags; (2) plastic canisters; and (3) light metal tins. By interacting electricity price with zero-one dummy variables that correspond to the three different packaging materials, we allow these three instrument variables to capture the likelihood that changes in electricity prices affect coffee products' production costs differently across different packaging processes. Furthermore, in principle this set of instruments is valid since changes in electricity price are unlikely to be driven by changes in coffee markets, making this set of instruments exogenous to coffee markets. The second set of price instruments are inspired by the supply theory which predicts that a product's price is affected by changes in not only its marginal costs but also its markup. Therefore, we include the following two variables as additional instruments for prices: (1) the number of competing products in a market that a given product faces, where the competing products each have the same net weight of dry coffee grounds (in ounces) in the package as the given product; (2) the number of competing products in a market that a given product faces, where the competing products each has the same caffeine content (in gram per ounce) as the given product. These two instruments capture the degree of competition facing a product in a market, which in turn affects the size of a product's markup.

The instrument variables for the log of within-group shares is a variable that measures the deviation of a product's promotional frequency with a temporary price cut from the mean promotional frequency across the set of products offered by the coffee manufacturer. Recall that we group products by the coffee manufacturer in the nested logit demand model. So, the above instrument variable is likely to be correlated with the within-group product share because, all else equal, among the products offered by a coffee manufacturer in a given market, consumers are likely to prefer the product that is the most frequently promoted. This instrument is inspired by a similar instrument in Chen and Gayle (2018) and Gayle and Thomas (2016) that measures a product's itinerary flying distance-based routing quality from the mean routing quality across the set of products offered by an airline in the origin-destination market.

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[18] Electricity price is from the US Energy Information Administration (EIA) website: (https://www.eia.gov/electricity/data/browser/#/topic/7?agg=0,1&geo=00fvvvvvvvvvo&endsec=vg&freq=M&start=201201&end=201212&ctype=linechart&ltype=pin&rtype=s&pin=&rse=0&maptype=0)

The instrument variables for the measure of presence intensity of Starbucks café shops, *N Café Shops*, are: (1) the median rental rates in the zip code areas; (2) the mean wealth levels approximated by the mean home values in the zip code areas. Guler (2018) found a positive and significant effect of wealth levels on consumer store visits. The paper uses the median rental rate to proxy for the Starbucks' café store rent expense as a component of café store fixed costs. These two variables are expected to be correlated with the location choices of Starbucks café shops across markets. Information of the mean wealth level and the median rental rate are obtained from Zillow's zip code-level home value index and rent index[19], respectively.

6. Empirical Results

6.1 Demand

The nested logit demand model estimates are reported in Table 4. The first set of columns report the parameter estimates using the ordinary least squares (OLS) estimator without instrumenting for the price, the logarithm of within-group product share (lnS_{jsg}), as well as the presence variables of Starbucks café shops (*N Café Shops* and its interaction term with *Starbucks Dummy*). The second set of columns report the parameter estimates using the two-stage least squares (2SLS), where we have instrumented for the above endogenous variables using the set of instrument variables discussed in the previous section. Comparing the two sets of demand estimates, one notices that the coefficient estimate for each endogenous variable is substantially different with instrumentation compared to not using instruments. The Wu-Hausman endogeneity test statistic of 102,470 confirms the endogeneity of price, the logarithm within-group product share, and Starbucks café shop presence variables by rejecting the exogeneity of these variables at 1% level. It suggests that the OLS estimation produces biased and inconsistent estimates of the price coefficient. Moreover, the weak instrument test using Kleibergen-Paap Wald F test yields a test statistic of 507.46 with p-value of 0, rejecting the null hypothesis that the instruments used in the estimation are weak. We focus the remainder of our analysis on the 2SLS demand estimates.

The coefficient estimate on the price variable is negative and statistically significant at 1% level, indicating coffee price, on average, has a negative impact on consumers' mean utility. All else equal, an increase in a product's price reduces the probability that a typical coffee drinker

[19] https://www.zillow.com/research/data/

chooses the product. The coefficient estimate on the logarithm within-group product share, lnS_{jsg}, which is an estimate of σ should lie between zero and one, and measures the correlation of consumers' preferences for products offered for sale by the same coffee manufacturer. Given that we nest coffee products by manufacturers, and σ is statistically significant, it suggests that coffee drinkers show some level of brand-loyalty to coffee producers. However, since the estimate of $\hat{\sigma} = 0.255$, is closer to zero than it is to one, evidence of coffee brand-loyalty behavior is not very strong.

We now focus on analyzing the effect of the Starbucks café shops on consumer demand for the packaged ground coffee products sold in the grocery stores in the market where the Starbucks café shops are located. The coefficient estimate on the presence variable, *N Café Shops*, $\widehat{\gamma_1} = 0.728$, is positive and statistically significant at 1% level, suggesting a positive impact of the presence of Starbucks café shops on consumer demand for the packaged ground coffee products offered by all non-Starbucks brands sold in grocery stores. The positive sign of this coefficient estimate indicates that the increasing presence of Starbucks café shops in a market is associated with higher levels of consumer satisfaction from purchasing non-Starbucks brands packaged ground coffee products sold in the grocery stores. Starbucks café shops offer consumers opportunities to try a variety of coffee drinks and explore their preferences over different types or flavors of coffee. Consumers then can use the packaged ground coffee purchased from grocery stores to make their ideal coffee drink, even if the packaged ground coffee product is a non-Starbucks brand.

Next, we turn to the coefficient estimate on the interaction term between the counts of Starbucks café shops in the market and the dummy variable that equals to 1 if the packaged ground coffee product is a Starbucks branded product. This coefficient estimate, $\widehat{\gamma_2} = 1.164$, is positive and statistically significant at 1% level. The positive sign indicates that an increase in the number of Starbucks café shops in a market increases the marginal utility a typical consumer receives from purchasing Starbucks branded packaged ground coffee products instead of non-Starbucks branded coffee products in grocery stores. In summary, the demand model estimates provide evidence suggesting that the increasing presence of Starbucks café shops in a market increases not only the demand for non-Starbucks packaged ground coffee products, but increases by relatively more the demand for Starbucks branded packaged ground coffee products.

The coefficient estimate associated with the caffeine content variable is positive and statistically significant, suggesting that, holding all other coffee demand factors constant, consumers prefer coffee products that have higher caffeine content. A similar result is found in Bonnet and Villas-Boas (2016) that consumers have a significant and negative preference for caffeine-free products; thereby, a typical coffee drinker prefers coffee products that are not decaffeinated.

The variable that captures the extent of a coffee product being advertised under various promotional activities (i.e. feature, display, temporary price cuts), *Marketing Intensity*, is found to have a positive and statistically significant impact on consumer utility levels, and therefore a positive impact on demand. This finding is consistent with similar estimates in some previous work such as Guadadni and Little (1998), Gupta (1988), Lattin and Bucklin (1989), Grover and Srinivasan (1992), Boatwright, Dhar and Rossi (2004), Ansari, Bawa and Ghosh (1995). These studies all provide empirical evidence that promotional activities have a positive impact on coffee demand. Gupta (1988), for example, argues that promotion enhances a brand's value, which in turn enhances the probability of products of this brand being selected by consumers.

The coefficient estimate associated with the zero-one dummy package size variable, *Large*, is positive and statistically significant, suggesting that coffee products that are presented to consumers in large packages (> 16 oz) have a higher demand relative to coffee products in smaller size packaging, all else equal. This result is consistent with a similar estimate as in Guadagni and Little (1998) and Ansari, Bawa, and Ghosh (1995). Prendergast and Marr (1997) argue that larger packaged consumer goods normally reflect better value to average consumers, and consumers tend to choose larger packaged products as they are more likely to stand out on the shelf. Last, we find an average coffee drinker tends to prefer non-organic coffee products during the sample period given by the negative sign of the coefficient estimate on the organic dummy.

Table 4: Nested Logit Demand Estimates

	(1) OLS		(2) 2SLS	
	Dependent Variable	$lnS_j - lnS_0$	Dependent Variable	$lnS_j - lnS_0$
Variables	**Coef**	**Std. Error**	**Coef**	**Std. Error**
Price ($/oz) ($\hat{\alpha}$)	-1.919***	(0.0115)	-5.485***	(0.107)
lnS_{jsg} ($\hat{\sigma}$)	0.536***	(0.000829)	0.255***	(0.00464)
N Café Shops ($\widehat{\gamma_1}$)	-0.247***	(0.00169)	0.728***	(0.0179)
Starbucks Dummy×N Café Shops ($\widehat{\gamma_2}$)	0.290***	(0.00638)	1.164***	(0.153)
Caffeine	0.0244***	(0.00154)	0.122***	(0.00322)
Marketing Intensity	0.0878***	(0.000811)	0.0141***	(0.00338)
Large	0.285***	(0.00288)	0.0632***	(0.0113)
Organic	-0.0843***	(0.0117)	-0.0734***	(0.0172)
Constant	-5.995***	(0.340)	-4.693***	(0.141)
R-squared	0.423		0.148	
Wu-Hausman Endogenous Test (F)			102,470***	
Weak Instrument Test (Kleibergen-Paap rk Wald F statistic)			507.422***[20] (p-value=0.0000)	
Number of Observations	1,367,962			

*p<0.1, **p<0.05, ***p<0.01. Standard errors are reported as robust standard errors in parentheses. Both regressions include time and brand fixed effects.

6.2 Markups and Marginal Costs

An important procedure for the counterfactual experiment in later sections requires the estimates of marginal cost implied by the previously specified oligopolistic model of competition between firms that supply packaged ground coffee products sold in grocery stores. The oligopolistic model we use assumes coffee firms set coffee product prices according to a static Nash equilibrium price-setting game. Optimal price-setting behaviour of firms in the oligopoly model implies a set of equations that depend on demand parameter estimates and allows us to

[20] The critical values reported for the Kleibergen-Paap statistics are the Stock-Yogo (2005) critical values for the Cragg-Donald (1993) i.i.d. case. However, the critical values for more than 3 endogenous variables are not tabulated in Stock and Yogo (2005). We consider the statistics of 507.422 is sufficiently large enough to reject the null hypothesis of weak instruments as it is much greater than a comparable critical value of 13.95 when there are 3 endogenous variables and 7 excluded exogeneous instruments at 5% level reported in Table 1 in Stock and Yogo (2005). In addition, the F-test statistics of the excluded instruments at the first stage estimations all have p-values of 0 for the four endogenous variables in the demand regression. (also see detailed discussions: http://www.repec.org/bocode/i/ivreg2.html)

compute product-level markups and recover estimates of product-level marginal costs. With the product-level marginal costs in hand along with demand parameter estimates, we again use the optimal price-setting behavioural equations implied by the oligopoly model to perform a counterfactual experiment.

In Table 5, we report the summary statistics of product-level price, markup, marginal cost, as well as the estimate of own-price elasticity, for Starbucks and non-Starbucks branded products across markets with a different number of Starbucks café shops. A broader picture shown in this table is that, on average, the retail prices for products of Starbucks coffee brands are much higher than the retail prices for non-Starbucks branded products across markets with each level of Starbucks café shop presence. The retail price difference is the most prominent in markets with four Starbucks café shops. The average retail price of Starbucks' packaged ground coffee products, 77.85¢ per oz, is 63% higher than the average retail price of non-Starbucks packaged ground coffee products sold in grocery stores, 47.80¢ per oz. The distinction of the mean retail price levels between Starbucks branded and non-Starbucks branded packaged ground coffee products is clearly shown in Figure 3, where the price gap is the largest when there are four Starbucks café shops in the markets.

The average price-cost markup of Starbucks branded packaged ground coffee products increases with the number of Starbucks café shops in the market; whereas, the average markups of non-Starbucks branded packaged ground coffee products show little variations, i.e. 16.82¢ to 17.63¢ per oz. The relationship between the mean estimate of product price-cost markups of Starbucks brands and non-Starbucks is depicted in Figure 4.

Subtracting estimated markup from the observed price for each product yields implied marginal cost. Similar to what we find about the average retail prices, the overall mean of marginal costs for Starbucks-branded ground coffee products is greater than the mean of marginal costs for non-Starbucks-branded ground coffee products sold among grocery stores. In Figure 5, the estimate of mean marginal costs for Starbucks products generally declines with the number of Starbucks café shops in the market.

The average price elasticity of Starbucks packaged ground coffee products, 4.94, is slightly greater than the average price elasticity of non-Starbucks packaged ground coffee products, 3.53. The difference between the two estimates reveals that consumer demand for packaged ground coffee products of Starbucks brands is more sensitive to price changes of these products compared to the sensitivity of consumer demand for non-Starbucks branded packaged ground coffee products to price changes of these products. In addition, the magnitude of the mean elasticity estimate of Starbucks packaged ground coffee products tends to be greater in markets with more Starbucks café shops, with the exception in markets with three Starbucks café shops. In general, consumers are more sensitive to price changes of Starbucks' packaged ground coffee products sold in grocery stores in markets where they are exposed to more Starbucks café shops that serve closer substitutes. This finding can also be drawn from Figure 6. The estimates of own-price elasticity for the ground coffee products are similar to the analogous estimates obtained in previous studies: Krishnamurthi and Raj (1991) (own-price elasticity estimates ranging from 3.6 to 8.2); Broda and Weinstein (2006) (own-price elasticity estimate of 3.1); Foster, Haltiwanger and Syverson (2008) (own-price elasticity estimate of 3.65); and Nakamura and Zerom (2010) (own-price elasticity estimate of 3.96).

Table 5: Summary Statistics of Price, Markup, Marginal Cost, Elasticity, by *N Café Shops*[21]

N Café Shops	**Starbucks Brands**			
	Mean Price (¢/oz)	Mean Markup (¢/oz)	Mean Marginal Cost (¢/oz)	Mean Own-price Elasticity*
NONE	69.77	16.78	52.99	4.91
1	69.34	16.70	52.64	4.95
2	69.88	17.21	52.67	5.01
3	67.32	19.77	47.55	4.84
4	77.85	31.56	46.29	5.46
MEAN	69.48	16.80	52.67	4.94

N Café Shops	**NON-Starbucks Brands**			
	Mean Price (¢/oz)	Mean Markup (¢/oz)	Mean Marginal Cost (¢/oz)	Mean Own-price Elasticity*
NONE	47.66	16.97	30.69	3.38
1	51.16	16.82	34.34	3.62
2	49.12	17.17	31.95	3.52
3	49.24	17.34	31.90	3.54
4	47.80	17.63	30.17	3.45
MEAN	49.82	16.90	32.92	3.53

*Own-price elasticities are reported in absolute values.

[21] The model generates 2,383 products (≈0.17%) with negative marginal cost estimates. A more detailed summary statistics are reported in the Appendix.

Figure 3: Observed Price

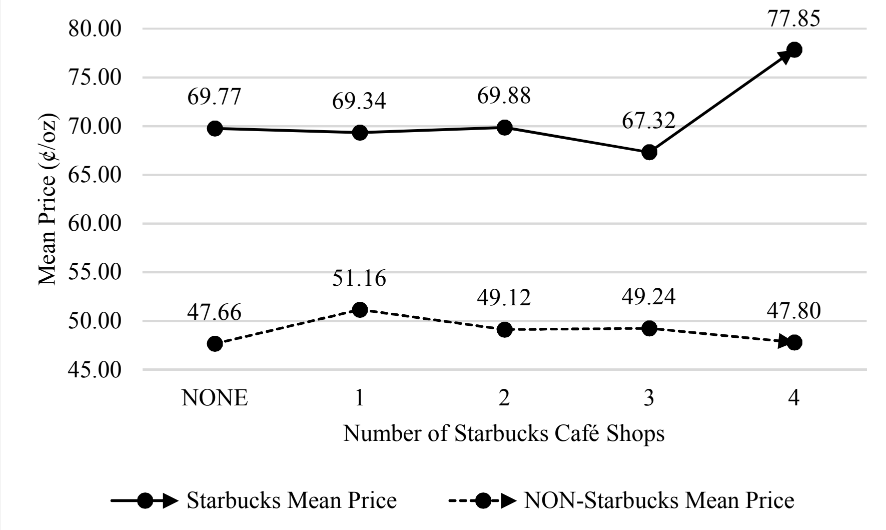


Figure 4: Markup

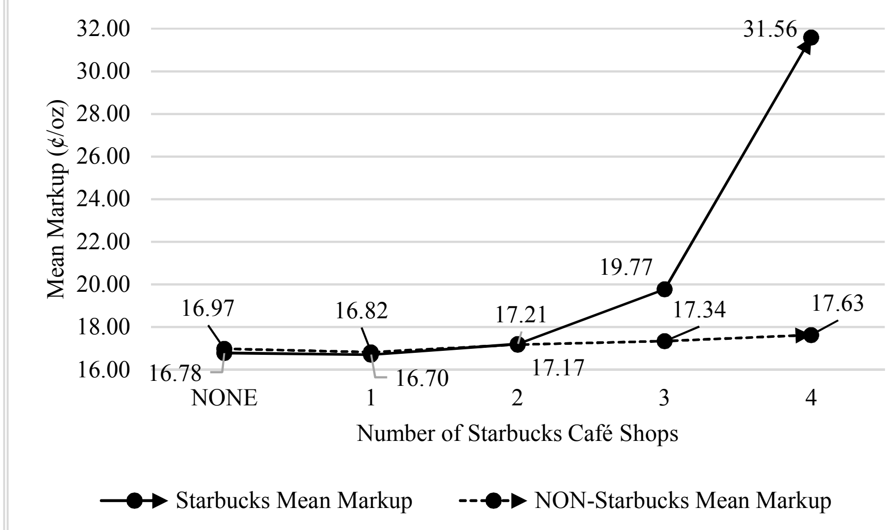


Figure 5: Marginal Cost

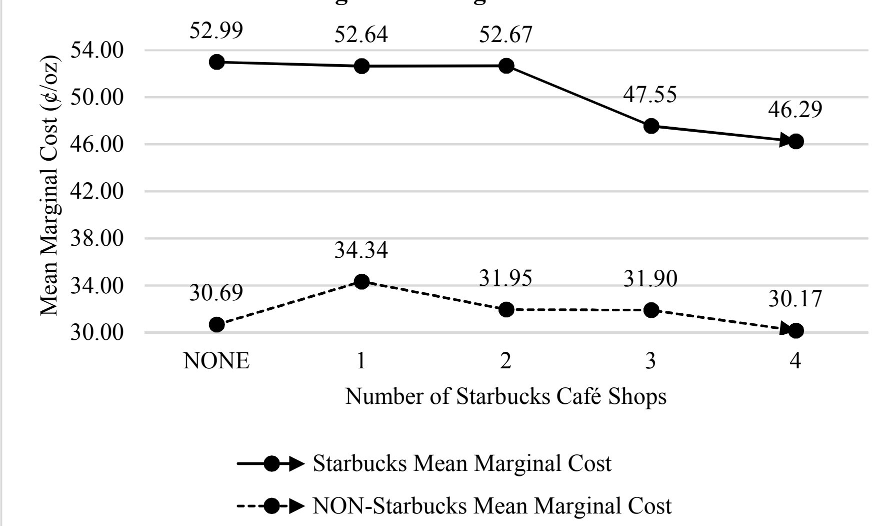
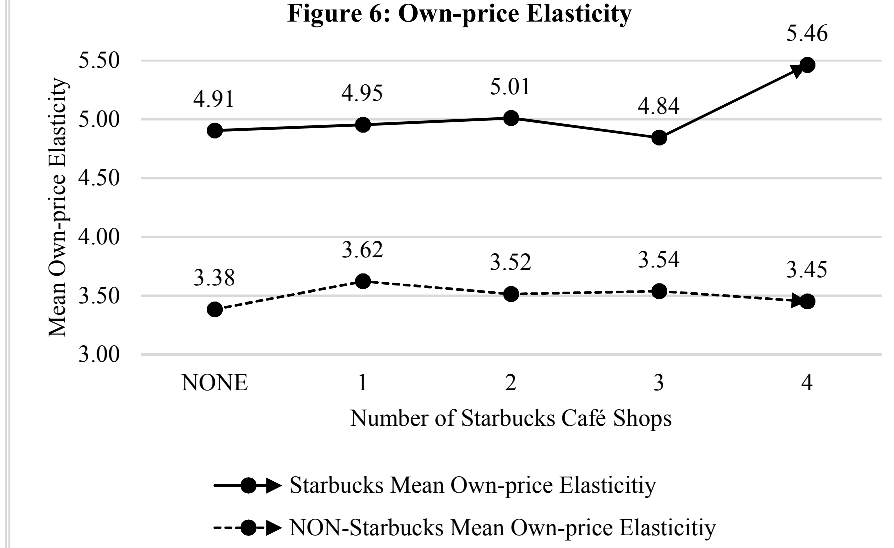


Figure 6: Own-price Elasticity



6.3. Counterfactual Analysis: *N Café Shops** = *N Café Shops* + 1

We perform a counterfactual experiment to assess the extent to which a marginal increase in the presence of Starbucks café shops (i.e. increasing the number of existing Starbucks café shops in the market) influences the equilibrium prices, quantities, and variable profits of Starbucks and non-Starbucks packaged ground coffee products sold in grocery stores. Using the estimated product-level marginal costs, estimated structural parameters, and first-order condition equations resulting from Nash price-setting behaviour of firms, we simulate the resulting market equilibrium from imposing the counterfactual assumption of a marginal entry of one Starbucks café shop across markets with no Starbucks café shops and markets with at least one Starbucks café shop.

The counterfactual experiment is operationalized by adding the Starbucks café shop presence variable, *N Café Shops*, by one. Let *N Café Shops** denote the counterfactual presence of Starbucks café shops in a market that enters consumer utility function. We solve for the new equilibrium prices according to the first-order conditions implied by Nash price-setting behaviour, the 2SLS demand parameter estimates reported in Table 4, and the recovered marginal cost estimate. A comparison of the model's predicted product-level price before and after a counterfactual increase in the presence of Starbucks café shops reveals the extent to which an increase in the presence of Starbucks café shops in the market influences the product-level prices for packaged ground coffee products sold in grocery stores.

The new equilibrium price vector solved from the first-order conditions is then used to recover other equilibrium market outcomes of interest including the product quantity and variable profit according to equations (36) and (40). We next discuss how the new equilibrium price, quantity, and variable profit are affected by the counterfactual reduction in the presence of Starbucks café shops.

Predicted Changes in Price

In the top panel of Table 6, we summarize the mean observed retail prices, mean predicted prices, the mean predicted percent changes in product price before and after the counterfactual addition of one Starbucks café shop across all markets. There are 116,537 retail packaged coffee products that are Starbucks branded and 1,251,425 retail packaged coffee products that are non-Starbucks branded. On average, the product-level retail prices are predicted to increase by 0.59% for Starbucks brands and 0.29% for non-Starbucks brands. However, the average predicted product prices of Starbucks coffee brands increase with the presence intensity of Starbucks café shops in the market. For example, the mean percentage price increase of Starbucks coffee products is 0.07% in markets that originally have no presence of Starbucks café shops; whereas, the mean price increase is 16.07% in markets that originally have four Starbucks café shops.

This above pattern of the predicted changes in product prices of Starbucks coffee brands is not found in the mean price changes of non-Starbucks branded coffee products. The mean retail prices for non-Starbucks brands increase with the number of existing Starbucks café shops only in markets originally with no Starbucks café shops and markets originally with only 1 and 2 Starbucks café shops. Comparing the predicted retail product price changes between Starbucks and non-Starbucks brands in these markets, we find the predicted retail product prices of non-Starbucks coffee brands seem to increase in greater magnitude than that of Starbucks brands in markets originally with no Starbucks café shops. Put differently, the marginal entry of a Starbucks café shop in markets without Starbucks café shops is predicted to cause a greater marginal impact on retail packaged ground coffee product prices of non-Starbucks coffee brands compared to the marginal impact on retail packaged ground coffee product prices of Starbucks-own coffee brands. Whereas, the opposite predictions are found in markets that original have a low level of Starbucks café shop presence, i.e. markets initially have only 1 and 2 Starbucks café shops. In these markets, the marginal entry of a Starbucks café seems to have a greater marginal impact on the retail prices of its own coffee brands than its competing coffee brands in grocery stores.

On the other hand, the counterfactual experiment also predicts that in markets initially with 3 and 4 Starbucks café shops, the retail product prices of non-Starbucks coffee brands are predicted to decrease by 0.003% and 0.202%, respectively, rather than increase. To take a closer look at the new equilibrium product prices changes in the bottom panel of Table 6, we summarize the retail price of non-Starbucks packaged coffee products that have positive predicted changes and that have negative predicted changes, respectively. Among all non-Starbucks coffee products sold in grocery stores, 99.12% of these products, i.e. 1,240,387, have a counterfactual increase in retail prices across markets with different intensity of Starbucks café shop presence when there is a marginal entry of a Starbucks café shop. The mean predicted retail price increase is greatest in markets initially having 2 Starbucks café shops, 0.6%, and smallest in markets initially having 4 Starbucks café shops. However, there are only 0.88% of non-Starbucks retail packaged coffee products, i.e. 11,038, are predicted to have a counterfactual decrease in retail prices when there is a marginal entry of a Starbucks café shop. These products are sold in markets with high presence of Starbucks café shops, i.e. markets that originally have 3 or 4 Starbucks café shops. These results suggest that a marginal entry of a Starbucks café shop has an outweighed negative marginal impact on the retail prices of non-Starbucks retail packaged ground coffee products in markets with a higher presence of Starbucks café shops, likely causing the equilibrium retail prices of these products to decline when a new Starbucks café shop open in the markets.

These predictions on the retail price levels for products of Starbucks and non-Starbucks brands drawn from the counterfactual experiment can be easily observed in Figure 7, where we plot both the observed and predicted price levels, and price changes in percentage, for Starbucks and non-Starbucks packaged ground coffee products sold in grocery stores in markets with different numbers of Starbucks café shops. The figure reveals that the marginal impact of the presence of Starbucks café shops on retail pricing of Starbucks package ground coffee products in grocery stores is larger in markets with more Starbucks café shops, whereas the marginal entry of a Starbucks café shop has a relatively small impact on retail prices of non-Starbucks retail coffee brands.

Table 6: (a) Counterfactual Experiment - Product-level Price Changes with *N Café Shops* + 1

	Starbucks Brands			
N Café Shops	Mean Price (¢/oz)	Mean Counterfactual Price (¢/oz)	Mean Percentage Change (%)	NO. of obs
0	69.77	69.81	0.07	31,469
1	69.34	69.71	0.55	79,997
2	69.88	71.69	2.65	3,825
3	67.32	72.34	7.45	928
4	77.85	89.98	16.07	318
MEAN	69.48	69.88	0.59	116,537

	NON-Starbucks Brands[22]			
N Café Shops	Mean Price (¢/oz)	Mean Counterfactual Price (¢/oz)	Mean Percentage Change (%)	NO. of obs
0	47.66	47.73	0.21	439,688
1	51.16	51.27	0.33	745,931
2	49.12	49.32	0.60	47,428
3	49.24	49.23	-0.003	11,085
4	47.80	47.72	-0.202	7,293
MEAN	49.82	49.92	0.29	1,251,425

(b) Products of NON-Starbucks Brands

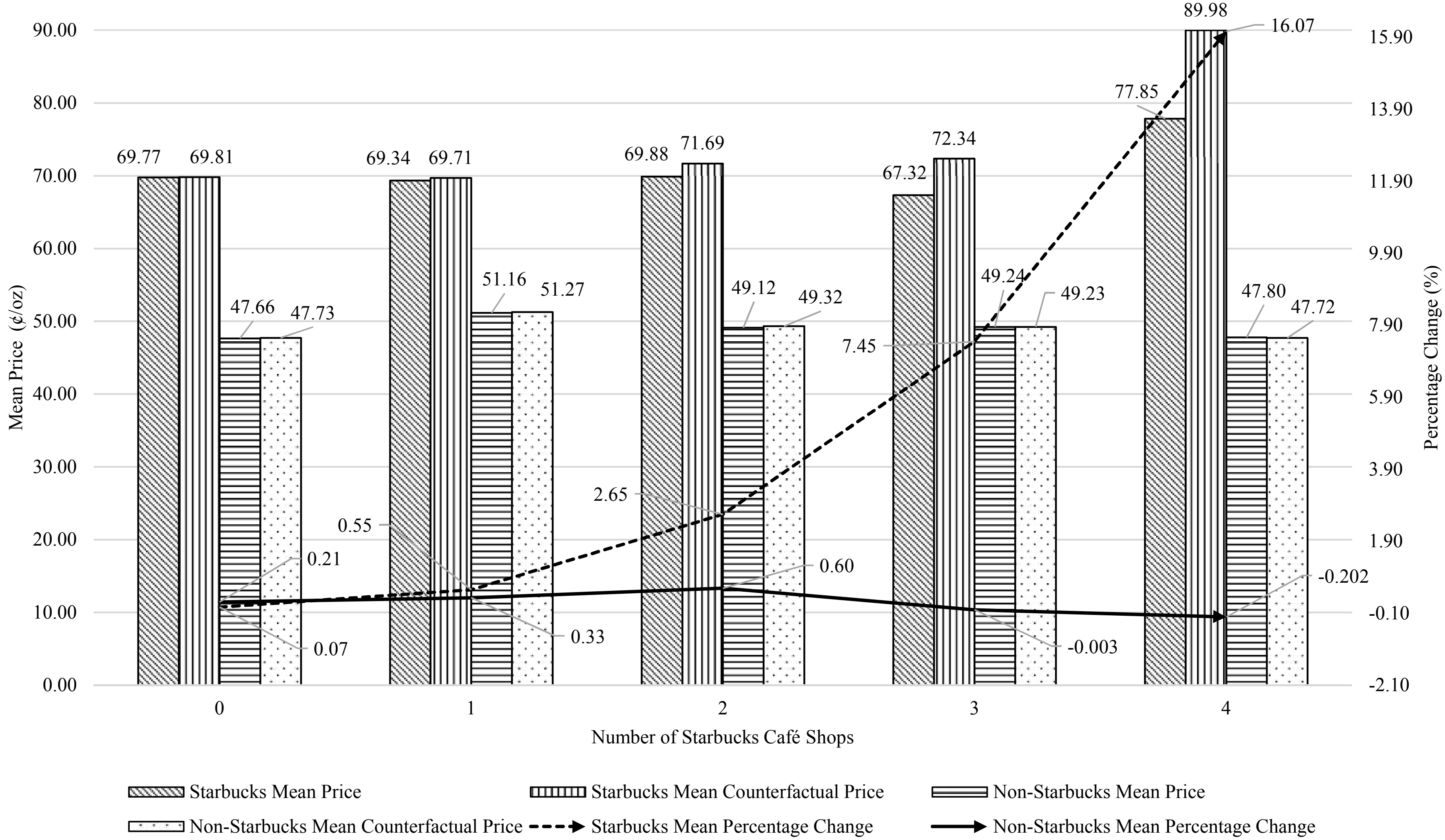
	Products with Positive Counterfactual Price Change			
N Café Shops	Mean Price (¢/oz)	Mean Counterfactual Price (¢/oz)	Mean Percentage Change (%)	NO. of obs
0	47.66	47.73	0.21	439,687
1	51.16	51.27	0.33	745,923
2	49.12	49.32	0.60	47,428
3	48.82	48.89	0.203	6,048
4	47.98	48.04	0.178	1,301
MEAN	49.83	49.93	0.30	1,240,387

	Products with Negative Counterfactual Price Change			
N Café Shops	Mean Price (¢/oz)	Mean Counterfactual Price (¢/oz)	Mean Percentage Change (%)	NO. of obs
0	143.53	143.53	-0.0000213	1
1	146.93	146.93	-0.0000167	8
2	-	-	-	-
3	49.74	49.65	-0.250	5,037
4	47.76	47.65	-0.285	5,992
MEAN	48.74	48.64	-0.27	11,038

[22] We believe the model predicts quite well the change in product price for non-Starbucks coffee brands, even though few observations (≈0.88%) have the unexpected price changes.

Figure 7: Counterfactual Experiment - Product-level Mean Price Changes

Starbucks v.s. NON-Starbucks



Predicted Changes in Quantity and Variable Profit

Table 7 summarizes the counterfactual changes in monthly quantity for a typical retail packaged ground coffee product belonging to Starbucks brands in a market, and for a typical retail packaged ground coffee product belonging to non-Starbucks brands in a market. In general, we find that the counterfactual entry of a Starbucks café shop may have a positive or negative impact on the quantity sold of any packaged ground coffee product in grocery stores. Predicted quantity sold for a typical Starbucks retail packaged ground coffee product and for a typical non-Starbucks retail packaged ground coffee product increases in some markets but decreases in other markets. Among all the markets selling Starbucks packaged ground coffee products in grocery stores, the majority of these markets, i.e. 14,382, have a mean increase of 4,254.62% in the monthly quantity sold of Starbucks coffee products when a Starbucks café shop enters in the counterfactual experiment; whereas, only 943 markets have the opposite predicted mean quantity changes, with a mean quantity decrease of -42.87%. In addition, the predicted mean quantity reduction of Starbucks retail packaged coffee products only occurs in markets with no and low presence of Starbucks café shops, i.e. 0 or 1 Starbucks café shops; and therefore, all the markets with a higher presence of Starbucks café shops, i.e. 2, 3 and 4 Starbucks café shops, experience a mean quantity increase of Starbucks packaged ground coffee products sold in grocery stores. This finding implies that in markets where there are already having greater presence of Starbucks café shops (2, 3 or 4), an entry of one additional Starbucks café shop is more likely to increase the sales of Starbucks packaged ground coffee products in grocery stores; and in markets where there are no, or one, Starbucks café shop, an entry of one additional Starbucks café shop will either increase or decrease the sales of its own packaged ground coffee products sold in grocery stores.

Regardless of mean quantity increase or decrease for Starbucks packaged ground coffee products sold in grocery stores, a general pattern is that the magnitude of impact associated with the counterfactual entry of one Starbucks café shop on the quantity sold of a typical Starbucks coffee product increases with the presence of Starbucks café shops. Put differently, a marginal increase in the presence of Starbucks café shops is predicted to affect the sales of retail packaged ground coffee products more severely in markets where there are already having some Starbucks café shops.

Similar findings related to all other non-Starbucks coffee products are found except the magnitude of predicted quantity changes for non-Starbucks retail packaged coffee products is smaller than that of Starbucks coffee brands at each level of Starbucks café shop presence. The mean quantity increase of non-Starbucks retail packaged coffee products is 819.45% across the majority of 16,104 markets with different levels of Starbucks café presence; whereas the mean quantity decrease is -35.85% only across 1,123 markets with no and low presence of Starbucks café shops. These findings also suggest that entry of one additional Starbucks café shop in a market that already has more than one Starbucks café shops is predicted to result in a mean increase in the sales of non-Starbucks retail packaged ground coffee products in the market. However, entry of one additional Starbucks café shop in a market that does not have a Starbucks café shop or only one Starbucks café shop may result in a mean increase or decrease in the sales of non-Starbucks retail packaged ground coffee products in the market.

The summary statistics of the mean predicted changes in variable profit for packaged ground coffee products sold in grocery stores are reported in Table 8. We find similar patterns for the counterfactual changes in variable profits of Starbucks and non-Starbucks retail packaged ground coffee products. For example, the positive (negative) change of a typical Starbucks retail packaged ground coffee product's profitability in a market, measured by its variable profit, increases with the actual number of Starbucks café shops in the market, and the magnitude of positive change is generally greater than the magnitude of negative change. There is no negative impact associated with the counterfactual entry of one Starbucks café shop on the profitability of Starbucks retail packaged ground coffee products in markets where there are already 2, 3 or 4 Starbucks café shops. Whereas, the counterfactual entry of one Starbucks café shop results in a negative impact on the profitability of a typical non-Starbucks retail packaged ground coffee product only in markets that originally have no and a single Starbucks café shop. Therefore, we may conclude that packaged ground coffee products sold in grocery stores in markets with greater presence of Starbucks café shops are more likely to experience increase in sales and profitability with the entry of an additional Starbucks café shop; whereas, the sales and profitability of retail packaged ground coffee products may either increase or decrease in markets having no or one Starbucks café shop.

Last, since variable profit is a function of product markup and quantity sold as shown in equation (40), we are able to decompose the change in variable profit by looking at the predicted change in product markup and quantity sold. The predicted change in markup underlies counterfactual impacts on equilibrium price levels based on the assumption that product-level marginal costs are unchanged. Therefore, the predicted product markup is expected to increase for packaged ground coffee products owned by Starbucks coffee brands sold by grocery stores across all markets and for the majority of retail packaged ground coffee products owned by all other non-Starbucks coffee brands sold by grocery stores with some products prices decrease in markets with a higher presence of Starbucks café shops. The similar pattern between the predicted change in quantity and variable profit for a typical packaged ground coffee product implies that the predicted change in product variable profit is primarily driven by the predicted change in product quantity rather than the predicted change in product markup.

Table 7: Counterfactual Experiment - Market-level Mean Quantity Changes with *N Café Shops* + 1

N Café Shops	Mean Quantity (oz)	Mean Counterfactual Quantity (oz)	Mean Percentage Change (%)	NO. of Markets
	Starbucks Brands: markets with positive counterfactual quantity change			
0	135.19	259.71	658.61	4,730
1	265.35	1961.61	4408.62	9,197
2	247.15	9118.32	26367.28	371
3	249.63	23683.17	56464.71	54
4	194.40	73201.46	156577.50	30
MEAN	221.87	1816.66	4254.62	14,382

N Café Shops	Mean Quantity (oz)	Mean Counterfactual Quantity (oz)	Mean Percentage Change (%)	NO. of Markets
	Starbucks Brands: markets with negative counterfactual quantity change			
0	346.64	87.37	-43.22	909
1	1200.38	341.29	-33.60	34
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
MEAN	377.42	96.52	-42.87	943

N Café Shops	Mean Quantity (oz)	Mean Counterfactual Quantity (oz)	Mean Percentage Change (%)	NO. of Markets
	NON-Starbucks Brands: markets with positive counterfactual quantity change			
0	232.15	271.10	411.22	5,553
1	243.18	624.81	1007.53	10,090
2	284.81	902.54	1626.92	377
3	342.06	866.28	1129.62	54
4	316.05	1506.17	2422.79	30
MEAN	240.82	511.80	819.45	16,104

N Café Shops	Mean Quantity (oz)	Mean Counterfactual Quantity (oz)	Mean Percentage Change (%)	NO. of Markets
	NON-Starbucks Brands: markets with negative counterfactual quantity change			
0	358.13	71.68	-36.53	1,073
1	473.20	165.10	-21.37	50
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
MEAN	363.25	75.84	-35.85	1,123

Table 8: Counterfactual Experiment - Market-level Mean Variable Profit Changes with *N Café Shops* + 1

	Starbucks Brands: markets with positive counterfactual profit change			
N Café Shops	Mean Variable Profit ($/m)	Mean Counterfactual Variable Profit ($/m)	Mean Percentage Change (%)	NO. of Markets
0	23.06	45.34	660.39	4,731
1	45.51	348.06	4489.43	9,197
2	44.18	1758.83	28395.93	371
3	50.47	5982.83	71423.53	54
4	56.78	27794.82	214560.50	30
MEAN	38.13	363.28	4536.06	14,383

	Starbucks Brands: markets with negative counterfactual profit change			
N Café Shops	Mean Variable Profit ($/m)	Mean Counterfactual Variable Profit ($/m)	Mean Percentage Change (%)	NO. of Markets
0	60.37	15.33	-43.18	908
1	211.47	60.58	-33.13	34
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
MEAN	65.82	16.96	-42.82	942

	NON-Starbucks Brands: markets with positive counterfactual profit change			
N Café Shops	Mean Variable Profit ($/m)	Mean Counterfactual Variable Profit ($/m)	Mean Percentage Change (%)	NO. of Markets
0	40.22	47.23	412.83	5,556
1	41.70	108.55	1014.70	10,092
2	49.92	160.76	1650.89	377
3	61.45	155.69	1132.68	54
4	56.79	265.19	2426.36	30
MEAN	41.48	89.07	825.03	16,109

	NON-Starbucks Brands: markets with negative counterfactual profit change			
N Café Shops	Mean Variable Profit ($/m)	Mean Counterfactual Variable Profit ($/m)	Mean Percentage Change (%)	NO. of Markets
0	62.13	12.46	-36.44	1,070
1	81.85	28.67	-21.89	48
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
MEAN	62.98	13.16	-35.81	1,118

Predicted Changes in Quantity/Variable Profit and Market Characteristics

We are interested in the relationships between the predicted changes in quantities sold and profitability of retail packaged ground coffee products and various market characteristics. To have a better picture of these relationships, in Figure 8, we plot the market frequency distributions of the adult populations across markets associated with the predicted changes in quantities sold of Starbucks ground coffee products in panel (a.1), and for the predicted changes in variable profit of the Starbucks ground coffee products in panel (a.2). We generate the similar plots for the non-Starbucks retail packaged ground coffee products in panel (b.1) and (b.2) in Figure 8. In Figure 9, we show the market frequency distributions of the mean household wealth levels, measured by mean home values, across markets associated with the predicted changes in quantities sold of Starbucks ground coffee products in panel (a.1), and for the predicted changes in variable profit for the Starbucks ground coffee products in panel (a.2). Similar plots are created for the retail non-Starbucks coffee products in panel (b.1) and (b.2) in Figure 9. For both Figure 8 and 9, the vertical axis counts the number of markets that have correspondent mean predicted quantity/profitability changes along the horizontal axis, where the red-filled and framed bars represent markets that have a mean quantity/profitability decline for retail packaged coffee products and the grey-colour framed bars represent markets that have a mean quantity/profitability increase for retail packaged coffee products.

From Figure 8, a clear pattern for both the mean predicted quantity changes and variable profit changes is that both the predicted increase in quantity sold and profitability of packaged ground coffee products, regardless of the brand ownership of these products, tend to occur in markets with relatively larger adult populations; whereas both the predicted decrease in quantity sold and profitability of packaged ground coffee products are likely to occur in relatively smaller population markets. However, we do not see a similar relationship in Figure 9, as we find that the frequency distributions of mean household wealth levels in markets that have the mean increase in quantity/profitability seem quite symmetric to that in markets that have the mean decrease in quantity/profitability. Markets that have mean quantity/profitability and markets that have mean quantity/profitability decrease of retail packaged ground coffee products tend to be the same markets that have mean household home values around $200,000.

Figure 8: Frequency Distributions of Market Adult Population
Starbucks v.s. NON-Starbucks

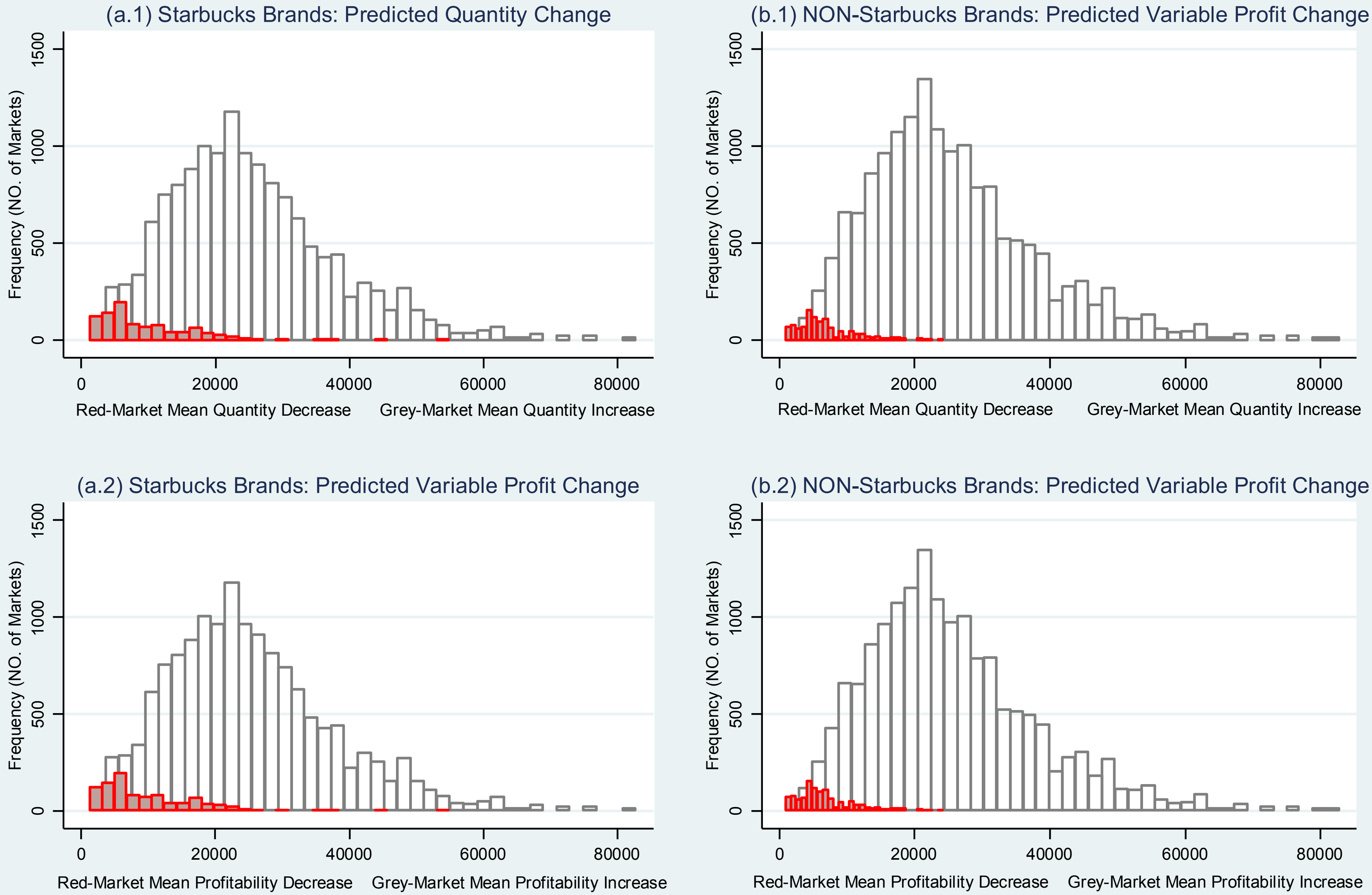
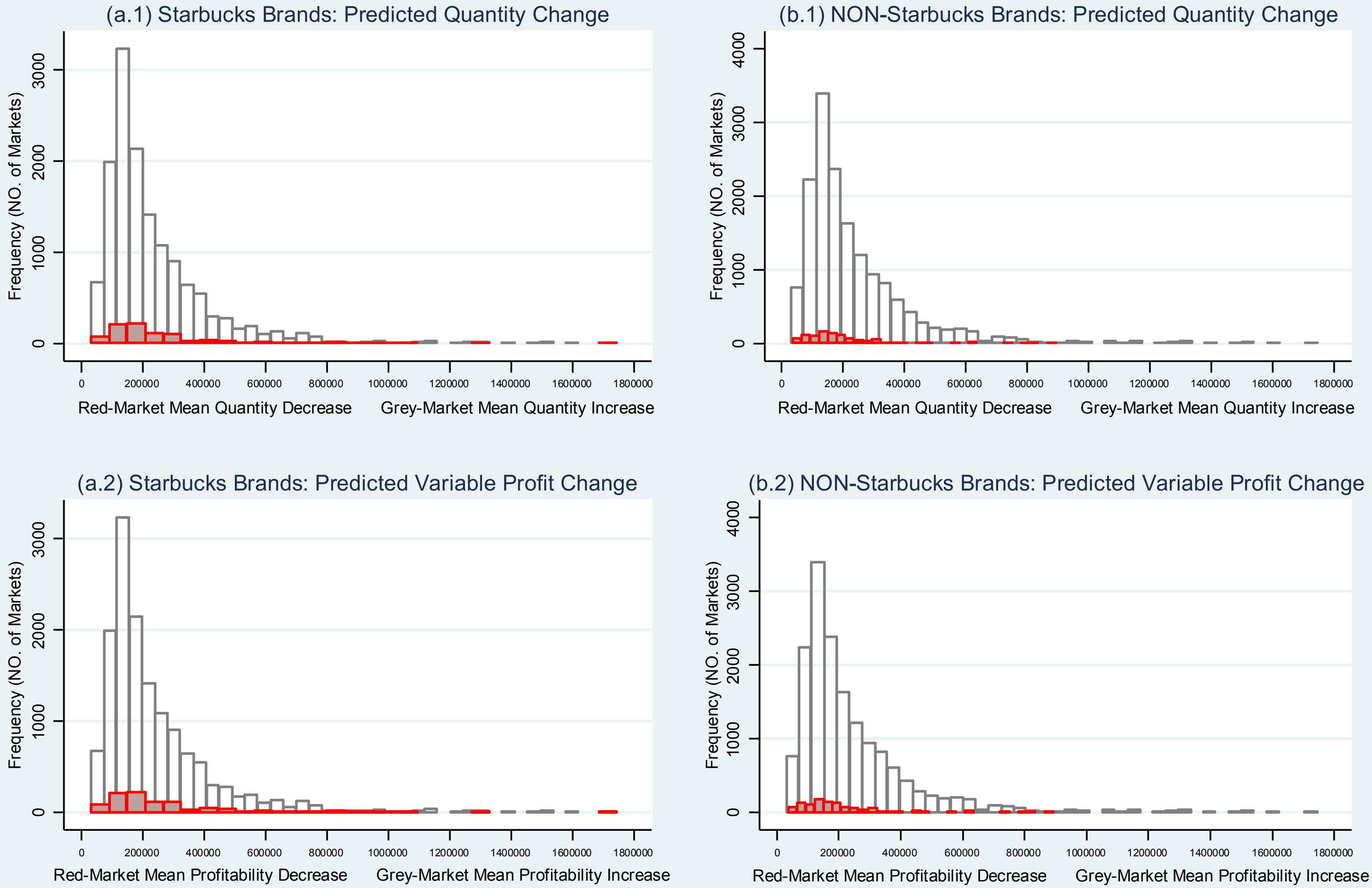


Figure 9: Frequency Distributions of Market Mean Household Wealth
Starbucks v.s. NON-Starbucks



*Note that the market mean household wealth level is approximated by the market mean home values in dollars from Zillows.

7. Conclusion

The primary objective of this paper is to study the extent to which the presence of Starbucks café shops in a local market impacts the sales, prices and profitability of Starbucks and competing non-Starbucks packaged ground coffee products sold in grocery stores. We begin the study by specifying and using a formal theoretical model to gain insights on the potential market forces at play that may ultimately influence market outcomes resulting from the presence of Starbucks café shops. Specifically, the theoretical analysis makes clear that the increasing presence of Starbucks café shops in a market may have the following impacts on packaged ground coffee products sold in grocery stores: (*i*) For Starbucks branded products, an increase in prices, but quantities sold may either increase or decrease; and (*ii*) For competing non-Starbucks branded products, quantities sold and prices may either increase or decrease. The theoretical model also makes clear the reasons for the ambiguous impacts on some market outcomes. Specifically, the increasing presence of Starbucks café shops in a market has two opposing effects on the demand for packaged ground coffee products sold in grocery stores, which are "*market expanding*" and "*business stealing*" effects.

On one hand, when more Starbucks café shops enter a market, consumers can more easily stop by one café to grab a cup of coffee and thus reduce the purchases of packaged ground coffee from grocery stores, this we refer to as a *"business stealing effect"*. On the other hand, the presence of Starbucks café shops could enhance consumers' valuations for packaged ground coffee products. Starbucks café shops offer consumers opportunities to try a variety of coffee drinks and explore their preferences over different types or flavours of coffee. Consumers then can use the packaged ground coffee purchased from grocery stores to make their ideal coffee drink. This *"market expanding effect"* can potentially benefit the sales of both Starbucks and competing non-Starbucks packaged ground coffee sales in grocery stores. Moreover, the "*market expanding effect*" is likely to be more pronounced for ground coffee products of Starbucks than non-Starbucks brands. In summary, the ultimate market outcomes resulting from the increasing presence of Starbucks café shops in a market depends on the relative strengths of market expanding and business stealing effects.

The theoretical insights motivate the subsequent empirical analysis to examine the systematic evidence on the impact on prices, sales, and profitability of packaged ground coffee products in grocery stores resulting from the increasing presence of Starbucks café shops in zip code delineated markets across the United States. The empirical analysis reveals that, for both Starbucks brands and competing non-Starbucks brands of packaged ground coffee products sold in grocery stores, the entry of an additional Starbucks café shop is predicted to increase retail prices of these products by 0.59% and 0.29% respectively, on average, across all markets. Furthermore, the marginal price impact on Starbucks retail packaged ground coffee products is larger in markets with more Starbucks café shops, reaching as high as a mean 16.07% increase for markets that already have four Starbucks café shops. Whereas, the marginal price impact on non-Starbucks retail packaged ground coffee products is positive unambiguously in markets with no or low presence of Starbucks cafés. The marginal price impact on non-Starbucks coffee brands could be positive or negative in markets with a high presence of Starbucks cafés and the average negative price change outweighs the average positive price change in these markets.

Second, we find that the entry of a Starbucks café shop may have a positive or negative impact on the quantity sold of any packaged ground coffee product in grocery stores. Predicted quantity sold for a typical Starbucks packaged ground coffee product and for a typical non-Starbucks packaged ground coffee product increases in some markets but decreases in other markets. Specifically, in markets with greater presence of Starbucks café shops (2, 3 or 4), an entry of one additional Starbucks café shop is more likely to increase the sales of both Starbucks and competing non-Starbucks packaged ground coffee products in grocery stores; and in markets where there are no, or one, Starbucks café shop, an entry of one additional Starbucks café shop will either increase or decrease the sales of any brand of packaged ground coffee products sold in grocery stores. Furthermore, regardless of mean quantity increase or decrease for Starbucks packaged ground coffee products sold in grocery stores, a general pattern is that the magnitude of impact associated with the counterfactual increase of one Starbucks café shop on the quantity sold of a typical Starbucks coffee product increases with the presence of Starbucks café shops.

Third, the positive change of a typical Starbucks packaged ground coffee product's profitability in a market, measured by its variable profit, increases with the actual number of Starbucks café shops in the market, and the magnitude of positive change is generally greater than the magnitude of negative change. In summary, we may conclude that packaged ground coffee products sold in grocery stores in markets with greater presence of Starbucks café shops are more likely to experience increase in sales and profitability with the entry of an additional Starbucks café shop; whereas, the sales and profitability of packaged ground coffee products may either increase or decrease in markets having no or one Starbucks café shop.

This paper joins the literature of “umbrella branding” and “brand extension”. In particular, our project investigates spillover effects of Starbucks café shops on the demand and pricing of its “umbrella branding” products, Starbucks packaged ground coffee products sold in grocery stores, as well as the competing brands’ of packaged ground coffee products sold in grocery stores. This research is different from previous empirical work of umbrella branding in two important ways. First, we allow the co-existence of both positive and negative spillover effects associated with a firm’s action in a given product category. A positive spillover effect increases the demand for related products, while a negative spillover effect decreases the demand for related products. Furthermore, we allow the relative magnitudes of these opposing effects to vary by the number of Starbucks café shops in a given market. Second, we not only analyze the demand spillovers within umbrella branding products but also explore the potential spillovers across competing brands, based on which we can more accurately evaluate the impacts of Starbucks cafés on the equilibrium prices and quantities sold of different brands of packaged ground coffee in grocery stores. Future research may use the methodological framework presented in this paper to examining umbrella branding strategies of firms in other industries.

Appendix

Table A-1: Price, Markup, Marginal Cost, Elasticity in Markets with *N Café Shop*=0

	Starbucks Brands				NON-Starbucks Brands			
	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity
Mean	69.77	16.78	52.99	-4.90	47.66	16.97	30.69	-3.38
Median	69.17	17.10	52.06	-4.83	44.16	17.76	26.78	-3.15
10% percentiles	56.68	14.50	39.52	-6.10	26.94	13.93	9.44	-5.15
90% percentiles	86.07	18.24	68.71	-3.80	73.71	18.27	57.28	-1.94
Std.Dev	12.07	1.38	11.73	0.91	18.12	1.63	18.68	1.26
NO. of Products	31,469				439,688			

Table A-2: Price, Markup, Marginal Cost, Elasticity in Markets with *N Café Shop*=1

	Starbucks Brands				NON-Starbucks Brands			
	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity
Mean	69.34	16.70	52.64	-4.95	51.16	16.82	34.34	-3.62
Median	66.62	17.11	50.18	-4.79	47.84	17.65	30.66	-3.39
10% percentiles	57.06	14.37	40.28	-6.15	27.29	13.92	10.33	-5.48
90% percentiles	85.93	18.28	68.53	-4.00	78.24	18.30	61.68	-1.96
Std.Dev	12.35	1.39	11.97	0.93	20.92	1.70	21.29	1.43
NO. of Products	79,997				745,931			

Table A-3: Price, Markup, Marginal Cost, Elasticity in Markets with *N Café Shop*=2

	Starbucks Brands				NON-Starbucks Brands			
	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity
Mean	69.88	17.21	52.67	-5.01	49.12	17.17	31.95	-3.52
Median	68.35	17.66	51.16	-4.88	45.43	18.12	28.03	-3.28
10% percentiles	56.16	14.60	38.85	-6.27	27.15	13.96	9.51	-5.34
90% percentiles	86.43	18.86	69.01	-3.89	74.03	18.62	59.48	-1.96
Std.Dev	12.39	1.57	11.98	0.94	19.51	1.76	20.09	1.36
NO. of Products	3,825				47,428			

Table A-4: Price, Markup, Marginal Cost, Elasticity in Markets with *N Café Shop*=3

	Starbucks Brands				NON-Starbucks Brands			
	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity
Mean	67.32	19.77	47.55	-4.84	49.24	17.34	31.90	-3.54
Median	65.87	20.47	46.48	-4.76	45.48	18.27	28.19	-3.28
10% percentiles	56.73	15.21	34.82	-6.01	27.13	13.94	9.07	-5.44
90% percentiles	82.36	24.21	62.52	-4.03	76.08	19.21	60.23	-1.97
Std.Dev	11.04	3.17	10.38	0.84	18.93	1.97	19.80	1.33
NO. of Products	928				11,085			

Table A-5: Price, Markup, Marginal Cost, Elasticity in Markets with *N Café Shop*=4

	Starbucks Brands				NON-Starbucks Brands			
	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity	Price (¢/oz)	Markup (¢/oz)	Marginal Cost (¢/oz)	Own-price Elasticity
Mean	77.85	31.56	46.29	-5.46	47.80	17.63	30.17	-3.45
Median	80.54	32.03	47.59	-5.75	44.81	18.31	26.77	-3.24
10% percentiles	61.45	27.25	27.22	-6.56	27.02	14.04	9.23	-5.25
90% percentiles	90.77	37.43	62.99	-3.99	73.71	19.76	57.11	-1.97
Std.Dev	11.81	5.65	13.54	1.00	17.75	2.04	18.45	1.26
NO. of Products	318				7,293			

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