Price Advertising In Franchised Chains: The Case Of McDonald's Dollar Menu*

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Abstract

We highlight the role of advertising as a mechanism for alleviating organizational agency problems. Through advertising, the chain informs consumers about a desired behavior for franchisees. Consequently, franchisees find it optimal to adopt the chain's desired behavior. We demonstrate this idea using McDonald's Dollar Menu advertising campaign in 2002. We exploit McDonald's dual organizational structure, operating both corporate-owned and franchised restaurants to test changes in the prices of advertised and non-advertised items. We find that price differences between franchised and corporate-owned outlets have decreased substantially only for items with good substitutes in the Dollar Menu. Second, the change in the price differential is larger in outlets located near highways, where the incentive of franchisees to free-ride on the chain's reputation is large. These findings suggest that the Dollar Menu advertising campaign has improved McDonald's control over its franchisees, and that, more generally, advertising could play an important role within the organization.

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1 Introduction

Chains choose to franchise outlets in order to provide franchisees with high-powered incentives to operate their outlets efficiently and to maximize profits.[1] Typically, a chain receives royalties based on its franchisees' sales and the franchisees, who own and operate their businesses, maximize the profits net of royalties. Nevertheless, the franchising literature has long emphasized the different incentives of the franchisees and the franchisor with respect to the chain's overall reputation. For instance, the chain considers future customers to be an important source of profits, regardless of the specific outlet they visit. A franchisee, on the other hand, maximizes her own, rather than the chain's, profits and is concerned about future customers only as long as they visit her own outlet. Thus, franchisees have little incentive, compared to the chain, to take the impact of their pricing decision on the chain's future sales into account.

In this paper, we empirically examine the inherent tension between the chain and its franchisees by focusing on the largest franchising chain, McDonald's. We offer a mechanism that a chain can undertake to discipline franchisees and to induce them to choose prices that are more aligned with the chain's objective. Our idea is that by advertising low prices, the chain alters consumers' expectations to be offered lower prices and indirectly exploits consumers to discipline franchisees' behavior. Thus, our main goals are to demonstrate that franchisees, maximizing their individual profits, choose prices that are too high (from the chain's point of view), and to show that a chain can discipline franchisees by advertising low-priced items.

The premise of our analysis is the notion of positive demand externalities - implying that lower prices at one outlet positively affect future demand at the same outlet as well as at other outlets of the chain. To establish a positive demand externality across the chain's outlets, we assume that consumers do not observe the price prior to entering an outlet and do not necessarily visit the same outlet each time they patronize the chain. In addition, higher

[1] According to Blair and Lafontaine (2005), franchising sales in the U.S. account for 12% of the GDP. The literature on franchising distinguishes between business-format franchising and traditional franchising. This paper focuses on the former.

(lower) prices have a negative (positive) effect on consumers' future demand, and consumers cannot completely differentiate between high prices at a particular restaurant and overall high chain prices. Consequently, a franchisee who owns one outlet has fewer incentives to take the impact of her pricing decisions on future sales into account compared to a franchisee who owns multiple outlets. Furthermore, since the profits of the franchisor are determined based on the sales across all outlets, the franchisor has an incentive to induce franchisees to internalize the demand externality by choosing lower prices, thereby increasing other outlets' sales. In

years. Thus, it is natural to focus on chains' efforts to maintain and enhance their reputation through advertising as well as to achieve uniformity across outlets. Importantly, the fact that outlets offer the same set of products enables us to examine the impact of price-advertising on advertised as well as on several non-advertised items. Finally, most franchising chains operate franchised outlets as well as corporate-owned outlets. Whereas, the chain controls the prices and quality in corporate-owned outlets, franchisees set the prices and decide whether to adopt the advertised prices at their outlets. This mixed structure of operations offers a unique opportunity to test the ability of the chain to affect prices at franchised outlets by comparing the two types of outlets.

Our paper contributes to several strands of the literature. First, we link the advertising literature and the organizational economics literature. We highlight a new role for price advertising as a mechanism for alleviating organizational problems. Price advertising in franchised chains is unique because the advertising and the pricing decisions are determined separately by different decision makers. The chain determines the content and scope of advertising, while the franchisees set the actual price.[4] Our findings also contribute to the existing literature on the effect of advertising on retailers' profits and prices. In particular, we are able to provide a simple explanation of the effects of advertisement on the prices of non-advertised items.[5]

Second, we provide empirical evidence for the benefits of vertical integration, in the sense of a chain's decision to operate through corporate-owned outlets or alternatively operate through independent franchisees. Indeed, despite a substantial body of theoretical literature on the costs and benefits of vertical integration, there exists only limited empirical evidence of the extent of these costs and benefits.[6] Our setup enables us to compare prices at franchised and corporate outlets and to rule out alternative explanations for the variation in prices which are not based on organizational structure. Indeed, several papers have discussed the concerns of chains over franchisees' free-riding problem,[7] and how chains try to mitigate this problem.[8]

[4]See Steiner (1973) and Farris and Albion (1980) for related arguments.

[5]See Bagwell (2005) for an extensive survey on the economic analysis of advertising and Milyo and Waldfogel (1999) for a related paper on the effect of price-advertising on the prices of non-advertised items.

[6]See Forbes and Lederman (2007) for another recent example.

[7]Most of the franchising literature refers to the franchisee agency problem as free-riding. See the survey by Lafontaine and Slade (2007)

[8]For example, Brickley and Dark (1987) examined how repeat customer patterns affect decisions regarding the location of franchised outlets vs. corporate-owned outlets. Other papers addressing the free-riding problems

Other papers have used cross-sectional data to explore how franchisees' product quality and prices differ from the quality and prices in corporate-owned outlets.[9] However, these papers have not used quantity and panel price data or exploited a change in franchisees' incentives to set lower prices as we do here.[10]

Finally, our paper contributes to the empirical literature on reputation, illustrating how a chain can maintain and enhance its reputation. Previous empirical papers on reputation have generally focused on the demand side of reputation and how consumers react to exogenous events that affect a firm's reputation.[11] This paper, on the other hand, offers a supply-side analysis of a reputation-enhancing mechanism.

The remainder of the paper is organized as follows. Section 2 provides information on McDonald's Dollar Menu and describes the data used in the paper. The estimation results of the Dollar Menu's effect on prices, the sales data analysis, the analysis using the highway proxy and the airport data analysis are presented in Section 3. Section 4 reviews alternative explanations for the observed patterns. In Section 5, we discuss our results and offer concluding remarks.

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in the context of franchising include Rubin (1978), Brickley (1999), Klein and Leffler (1981) and Lafontaine and Shaw (2005).

[9]For example, Barron and Umbeck (1984) found that a change in the contractual arrangement at gasoline stations from refiner-controlled to a franchise operation reduced the hours of operation. Lafontaine and Slade (1997) present a survey of the empirical evidence for the different pricing patterns. Lafontaine (1995) provided evidence for fast-food chain restaurants in the Pittsburgh and Detroit metropolis, and Graddy (1997) found similar patterns in fast-food chains in New Jersey.

[10]Most closely related to this paper is the research of Jin and Leslie (forthcoming), who study the hygienic quality of restaurants and use an exogenous change in the available information possessed by consumers to study its effects on restaurants' incentives to maintain good hygienic quality. Unlike Jin and Leslie, we investigate how a chain can affect its franchisees' incentives to adhere to the chain's objective. Importantly, the chain cannot self-regulate the franchisee's behavior and needs to implement an alternative mechanism to achieve its goal.

[11]Borenstein and Zimmerman (1988), for example, examined how the demand for air travel is affected by accidents.

2 Dollar Menu, Data and Demand Externality Proxies

2.1 McDonald's Dollar Menu

McDonald's Dollar Menu is a collection of 6 to 8 menu items that are sold for one dollar each. The Dollar Menu accounts for 14% of McDonald's sales in the U.S.[12] and it represents 10%-15% of McDonald's total advertising expenditure.[13] The Dollar Menu was introduced nationwide in September 2002 following a six quarter-period of relatively poor sales performance. According to industry news reports, it was an attempt to boost sluggish sales and cripple Burger-King, McDonald's main rival.[14]The Dollar Menu usually includes two main dishes - a Double Cheeseburger and a McChicken sandwich, together with side dishes and desserts, such as Small Fries, Small Soft Drink, Side Salad, Apple Pie and Sundae.[15] To promote the new Dollar Menu introduction, McDonald's added $20 million to its advertising budget in the last quarter of 2002. McDonald's 2002 annual financial report explains the 2002 increase in expenses: "The increase in 2002 was primarily due to .. higher advertising expenses in the U.S. primarily related to the introduction of the Dollar Menu." Based on conversations with franchisees, the introduction of the Dollar Menu is optional, and a franchisee can unilaterally decide *not* to offer the Dollar Menu.[16] McDonald's corporate officer was willing to say that

[12] According to McDonald's CEO, Ralph Alavarez, *Dow Jones Newswires*, 10/19/07

[13] McDonald's Earnings Conference Call, 01/24/06. See *http : //seekingalpha.com* for full transcript.

[14] James Cantalupo, McDonald's CEO at the time the Dollar Menu was introduced was cited saying: "We like to wear out our competitors with our price", *Business Week*, 03/03/03

[15] According to the New-York Times, the Double Cheeseburger has become McDonald's most ordered item since the Dollar Menu was introduced. *New York Times*, 04/19/2006. At first, the Dollar Menu included only the McChicken and the Big N' Tasty sandwiches. In November 2002 the non-entree items were added, and in February 2003, the Double Cheeseburger replaced the Big N' Tasty as the second dish offered in the Dollar Menu. All the outlets in Santa Clara County offer the Dollar Menu except the franchised outlet at the Stanford Shopping Center. There is some cross-regional variation in the Dollar Menu items. For example, in New York, the Dollar Menu usually includes a Chicken McNuggets item, whereas in the Santa Clara County it does not.

[16] *Business Week* cites a McDonald's franchisee complaining that the Big N' Tasty costs him $1.07 to make –so he sells it for $2.25 unless a customer asks for the $1 promotion price. "We have become our worst enemy" *Business Week*, 03/03/03. The Wall Street Journal cites a McDonald's franchisee, Irwin Kruger, saying that the dollar-value menu is not increasing sales at his seven New York City restaurants but rather squeezing profit because he is selling discounted items. For now, though, he says he is not concerned because part of McDonald's value strategy was to cripple rival Burger King, *Wall Street Journal*, 11/2/2002.

franchisees are encouraged to adopt the Dollar Menu.

2.2 Data

We constructed our data from several sources. Our main data set is an original panel data set collected in July 1999 and July 2006 regarding the location, price menu, outlet characteristics[17] and competition level[18] of all the hamburger outlets that are chain-affiliated in Santa Clara County, California.[19] In the empirical analysis, we examine the prices at McDonald's outlets and the data on the other chains are used to determine the competitive environment of an outlet.[20] The 1999 data were collected by Thomadsen (2005). We collected the 2006 data by visiting all the outlets in the Santa Clara County and documenting the menu prices and characteristics of the outlet.[21] Ownership data were obtained by cross-referencing several public records.[22] Outlets data are supplemented by zip code demographic data.[23] In addition, we use sales data from one McDonald's franchised outlet which adopted the Dollar Menu. The sales data include prices, the quantities sold for each item and the number of cashier transactions in that outlet for several months between 2001 and 2006.[24] The number of cashier transactions is used as a measure of the number of customers patronizing the outlet in a particular month. The third dataset was collected from hamburger restaurants located in the 35 largest U.S. airports. We collected information regarding whether these restaurants offer

[17]The observed outlet characteristics are: the number of seats, the presence of a playground, the presence of a drive-thru, the availability of wireless service at the outlet and whether the outlet is located in a mall.

[18]Defined as the number of hamburger chain-affiliated outlets located within a certain perimeter.

[19]There are about 300 outlets and the relevant chains are: Burger-King, Carl's Jr., In-N-Out, Jack-in-the-Box, McDonald's and Wendy's.

[20]We also obtain and present similar results when we analyze the prices of Jack-in-the-Box another big hamburger chain. McDonald's and Jack-In-The-Box are the only chains in Santa Clara County which operate a mixture of corporate-owned and franchised outlets.

[21]Outlet locations were obtained from chains' websites as well as from business locator services, such as Google Maps and Yahoo Local Maps. Prices were photographed (when permitted) and a subset of prices were copied when taking photographs was not possible.

[22]For each outlet we observe whether it is franchised or corporate-owned. Ownership data were assembled from the Assessor Office and the Public Health Department in Santa Clara County.

[23]Zip code demographics were obtained from the 2000 Census data and 2005 *Community Sourcebook America*. We use data on median household income, median rent contracts and dine out spending potential index.

[24]The sales data cover the following months: October 2001-2005, August 2002-2005, November 2002, March 2003-2006.

the Dollar Menu, an airport employee discount as well as ownership information and prices of a Big-Mac meal and a Double CheeseBurger.[25] [26] Figure 1 displays the Big-Mac meal price distributions using data from 2006 and 2007 divided into franchised and corporate outlets located in Santa Clara County and outlets located in U.S. airports.

2.3 Demand Externality Proxies

We employ two sets of proxies to represent an outlet's incentive to take the impact of its pricing decision on the chain's future sales into account. The primary set pertains to the distinction between a franchised and a corporate-owned outlet. We assume that a corporate-owned outlet located in Santa Clara County has a higher incentive to internalize the demand externality it imposes on future sales compared to a franchised outlet. This distinction relies on the different incentives of franchisees and the chain to encourage repeat business. The chain, unlike franchisees, benefits from a customer regardless of the specific outlet he attends and has stronger incentives to encourage customers to revisit any of the chain outlets by charging low prices. Since the chain has a larger incentive to encourage customers to revisit any of the chain outlet, it will set a lower price. The number of corporate and franchised outlets in 1999 and in 2006 as well as the entry and exit patterns of McDonald's outlets in the Santa Clara County are displayed in Table 1.

The secondary set of proxies enables us to distinguish between one franchised outlet and another and between one corporate outlet and another. The main secondary proxy we use is the outlet's distance from the highway, where a natural interpretation of that proxy is that, *ceteris paribus*, outlets located near a highway are characterized by fewer repeat customers and have a lower incentive to consider the impact of their pricing decisions on future sales compared to an outlet located at a distance from the highway.[27] Indeed, using the distance from a highway

[25] We also collected data on Burger-King restaurants located in airports. We inquired whether the restaurant offers BK Value Menu, an airport employee discount and ownership information.

[26] The airport restaurant data were collected by phone in September-October 2007. The ownership data was gathered also from the chains' websites. We also sampled few McDonald's restaurants in Santa Clara County in September 2007 and verified that prices have not significantly changed since July 2006.

[27] The 2000 Bay Area Travel Survey, *www.mtc.ca.gov*, reports that 60% of trips on the 101 Highway, one of the two main highways in Santa Clara County, are not home-work trips.

as a proxy for customers' tendency to repeat was mentioned several times in the literature.[28] Based on conversations with franchisees and survey data, we employ two additional suggestive proxies for an outlet's level of repeat business: the presence of a playground[29] and whether wireless service is offered at the restaurant.[30] Table 2 contains the number of outlets that are characterized by the secondary set of proxies divided into corporate and franchised outlets. A feature of these proxies is that each can be interpreted as accounting for a different segment of fast-food consumers: travelers, families with young children, and local high school students and workers. We employ these proxies separately and jointly when we analyze the pricing patterns of McDonald's restaurants.

3 Empirical Analysis

In this section we examine the changes in prices between 1999 and 2006 at franchised and corporate-owned outlets, and employ regression analysis on restaurants which adopted the Dollar Menu. We begin with a primary item of the Dollar Menu - the Double Cheeseburger - and then turn to analyze the changes of items whose price was not advertised, such as the Big-Mac Meal - McDonald's signature dish. To explain the distinct pricing patterns of the non-price advertised items, in Section 3.2 we analyze the sales data *before* and *after* the introduction of the Dollar Menu. The analysis demonstrates that non-price advertised items, characterized by high substitution with the Dollar Menu items suffered a significant decline in their price

[28] See Klein and Saft (1985) and Brickley and Dark (1987) for early references.

[29] Playgrounds attract children to McDonald's restaurants. Indeed, McDonald's performs a survey which is based on demographic trends at the vicinity of the outlet to determine the profitability of a playground. Furthermore, Robinson, Borsekowski, Matheson and Kraemer (2007) reports that 32% of the children in his sample, who reside in the San Francisco Bay Area, visit more than once a week at McDonald's and nearly 72% visit more than once a month at McDonald's. As a comparison, the results of the survey discussed in Appendix B indicate that only 2% of Stanford students visit more than once a week at McDonald's. Conversations with franchisees confirm our notion that children are more likely to revisit an outlet compared to other customer groups.

[30] Wireless service proxies for high school students, attending McDonald's restaurants. Franchisees confirm that high school students are more likely to use wireless service at McDonald's restaurants, and that high school students account for relatively large share of their clientele. Wireless service was not offered in 1999. We treat outlets that chose to offer wireless service in 2006, as catering to intermediate consumers with a tendency to repeat both in 1999 and 2006.

premia, whereas the price premium of other less substitutable items remained relatively stable. We then turn to utilize the secondary set of proxies, and preform a difference-in-difference-in-difference regression analysis to examine how an outlet location near the highway affects prices at franchised and corporate-owned outlets. Before discussing alternative explanations for our findings, we also present evidence on prices and on the availability of Value Menus in U.S. airports.

3.1 Price Patterns Across Adopting Outlets

3.1.1 Summary Statistics

The franchisee's price premium for the Double Cheeseburger, defined as the difference between the average franchise price and the average corporate price was 8 cents in 1999,[31] and it disappeared among adopting restaurants in 2006.[32] Descriptive statistics of the prices of the Big-Mac meal are presented in Table 3. The franchisee's Big-Mac meal premium decreased from 41 cents in 1999 to 22 cents in 2006. The standard deviation of the Big-Mac meal dropped from 24 cents and 27 cents in 1999 for corporate-owned and franchised outlets to 12 cents and 17 cents in 2006, respectively. Moreover, the price range decreased from \$1.10 in both types of outlets in 1999 to 50 cents in corporate-owned and 80 cents in franchised outlets in 2006. To provide additional descriptive evidence of the change in the Big-Mac meal price distributions from 1999 to 2006, we define an outlet-normalized price in year t as the ratio of the Big-Mac meal price in the outlet to the average Big-Mac meal price in the corporate-owned outlets in that year. The kernel densities of the normalized price of franchised and corporate-owned outlets in both time periods are presented in Figure 2. The Figure illustrates how the two price distributions approached each other from 1999 to 2006.

3.1.2 Regression Analysis

The following specification is used to test the changes in prices between 1999 and 2006:

$$ln(p_{it}) = \alpha + \gamma * D_{2006,it} + \delta * D_{franchised,it} + \eta * D_{2006,i} * D_{franchised,it} + \beta * X_{it} + \theta * Comp_{it} + \epsilon_{it} \quad (1)$$

[31] All the corporate outlets charged the same price, \$1.08 (with tax) for the Double Cheeseburger, and all the franchised outlets, except two, charged a higher price than the price at corporate-owned outlets.

[32] The only restaurant that did not adopt the Dollar Menu in 2006 charge \$2.59 for a Double Cheeseburger.

This specification tests the change in the prices of the Big-Mac meal, a non-advertised item and consists of outlets operating in both 1999 and 2006. p_{it} is the price in outlet i in year t. $D_{2006,i}$ is a dummy variable equal to 1 if outlet i operated in 2006. $D_{franchised,i}$ is a dummy variable equal to 1 if outlet i is a franchised outlet. X_{it} is a vector containing outlet i characteristics in year t including the number of seats, the existence of a drive-thru, the existence of a playground, whether the outlet is located in a mall and demographic variables of the zip code in which the outlet is located. The competition proxies indicate the number of competitors located near an outlet.[33]

Table 4 presents the estimation results for the Big-Mac meal price as the dependent variable. In the Big-Mac regression, we find that conditional on outlet characteristics and demographics, the franchisee's price premium for the Big-Mac meal significantly decreased from 12.42% in 1999 to 3.61% in 2006. All other outlet and demographic characteristics were insignificant with the exception of the coefficient of the dine-out spending potential index which was positive. The insignificant effects of the competition proxies are consistent with previous literature on the fast-food industry.[34] We perform the same analysis for all the meals that were offered in both 1999 and 2006. The results in Table 5 demonstrate two interesting patterns: for the Quarter Pounder and the Double Quarter Pounder meals, we find statistically significant reductions in the premiums from 7.2% to 1% and 7.4% to 2.8%, respectively. However, for the regressions of the Fillet-O-Fish, Chicken McNuggets 6 pc. and Chicken McNuggets 20 pc. as the dependent variables we find the following statistically insignificant price changes: 2.6% to 1.4%, 5.1% to 5.7% and 2.1% to 3.17%, respectively.[35]

Thus, our findings on the Dollar Menu item - the Double Cheeseburger indicate that the advertising campaign was successful in eliminating franchisee's price premium. The empirical evidence on the changes in the price premia for non-price advertised items depicts two distinct patterns: for some items we found that the price premia have fallen, whereas for some it remained stable.

[33]We present estimation results for two competition variables; close competitors, defined as the number of competitors within 0.1 mile from the outlet; far competitors, defined as the number of competitors within 0.1 to 0.5 miles. Using other criteria for the level of competition (e.g. perimeters around each outlet) and various specifications did not change our results.

[34]See Kalnins (2003), and Thomadsen (forthcoming).

[35]The results are almost identical if we only use data from outlets that operated in both time periods.

To demonstrate that the drop in the premium is not driven by unobserved changes at McDonald's, we performed the same basic empirical analysis for Jack-in-the-Box, another major hamburger chain. We found that the introduction of its Value Meal at the end of 2001 had a similar qualitative effect and report the estimation results for the Jumbo Jack meal, Jack-in-the-Box's signature dish, in Table 6. The average premium charged by Jack-in-the-Box franchisees dropped significantly from 5.7% in 1999 to -0.1% in 2006.[36]

3.2 Explaining the Variation in Price Changes across Non-Advertised Items

To explain the observed distinct patterns of the non-Dollar Menu items, we now turn to analyzing the sales data. In Figures 2 and 3 we present the time series of two measures of sales for the Big-Mac, Quarter Pounder, Chicken McNuggets 6 pc., and Fillet-O-Fish meals as well as for a combined measure of the Dollar Menu items: Double Cheeseburger and the McChicken sandwich.[37] The first measure presented in Figure 2 is an item percentage of total outlet sales in that month. The second measure displayed in Figure 3 is the proportion of cashier transactions for each item interpreted as the percentage of customers who bought a particular item. Each item measure is normalized based on its own August 2002 sales; in the lower part of the figures we display the Dollar Menu items time series, and in the upper part we present the regular menu meals time series.

The percentage of McChicken sales out of the total revenue surged from 2.06% to 4.36% between August 2002 and March 2004. The percentage of the Double Cheeseburger out of the total revenue skyrocketed from 0.18% to 2.96%. One explanation for this difference is the fact that the price of the McChicken sandwich has not changed, whereas the price of the double cheeseburger dropped by 50% following the introduction of the Dollar Menu. Over the same period of time the Big-Mac meal and the Quarter Pounder meal percentage of revenue dropped sharply from 7.7% to 5.62% and from 5.47% to 3.02%, respectively. On the other hand, the meals whose price premium has not changed between 1999 and 2006 exhibit a different pattern. For example, the Fillet-O-Fish rose from 2.83% to 3.05%, and the Chicken McNuggets 6 pc.

[36] We explore the changes in prices only at McDonald's and Jack-In-The-Box, since these chains are the only chains in Santa Clara County which operate a mixture of corporate-owned and franchised outlets.

[37] Since the Double Cheeseburger replaced the Big N' Tasty as the main item in the Dollar Menu in March 2003, we use the sales of the Big N' Tasty rather than the Double Cheeseburger sales during that period.

increased from 3.30% to 3.89%. Although the clear distinction in trends is not that obvious across the entire time period, the figure strongly suggests that the shift in sales towards the Dollar Menu items is largely driven by customers who had previously purchased the Big-Mac and the Quarter Pounder meals.[38]

Similar patterns arise when we examine the percentage of customers purchasing each item. From August 2002 to March 2004 the percentage of customers who bought the Double Cheeseburger and McChicken sandwiches increased from 0.4% to 14.6% and from 11.17% to 21.44%, respectively. On the other hand, the proportion of transactions in which the Big-Mac and the Quarter Pounder meals were sold dropped from 8.69% to 5.8% and from 6.18% to 3.12%, respectively. The non-substitutable meals exhibit a different pattern; The Fillet-O-Fish and McNuggets 6pc. percentage of cashier transactions change slightly from 3.89% to 3.84% and from 3.72% to 4.02%, respectively.[39]

We also conducted a survey among 104 undergraduate students exploring the substitution patterns across the Chicken McNuggets meal, the Big-Mac meal and the Dollar Menu items. The survey itself and the results are presented in Appendix B: 82% of the respondents who chose the Big-Mac meal before the Dollar Menu was available switched to a Dollar Menu option after it was introduced to them. On the other hand, only 53% of the Chicken McNuggets choosers switched to a Dollar Menu option when it was available. We compare the mean of the two groups and reject the null hypothesis of mean equality at 1% confidence level. Finally, Consistent with our argument, Matthew Paull, McDonald's Corporation CFO at the time the Dollar Menu was introduced acknowledged in an analysts conference call: "It brought in a lot of customers who might not have otherwise visited us. (But) We have seen a small drop in sales of our signature sandwiches, things like the Big-Mac and the Quarter Pounder

[38]Clearly, the evidence is based on only one outlet and should be regarded so. Moreover, it is hard to disentangle between the effect of the Dollar menu introduction on the Chicken McNuggets sales and the large drop in its sales between October 2001 and August 2002, prior to the introduction of the Dollar Menu.

[39]We also report the changes in the prices of the different meal items between August 2002 and March 2007. The prices of the Big Mac, Quarter Pounder and McNuggets 6pc. meals were always the same with 3 price increments. The total price change was 30 cents, roughly 7%. The Fillet-O-Fish meal price also changed 3 times over the period by 30 cents, an overall increase of 8%. The Double Cheeseburger price dropped from $1.99 to one dollar once it was added to the Dollar Menu, and the McChicken price was 99 cents before the Dollar Menu introduction and one dollar thereafter.

with Cheese. We're not thrilled with that."[40]

In the next section, we refine our analysis and utilize the secondary set of proxies to examine how the price variation within franchised-owned outlets and within corporate-owned outlets is correlated with these proxies.

3.3 Refining the Repeat Customers Analysis

In this section we utilize an outlet distance from a highway to explore more in-depth how it affects prices. Our interpretation for the highway location is that franchised restaurants located near highways cater to fewer repeat customers, and, thus, these franchised outlets are more likely to free-ride on the chain's reputation and charge higher prices compared to franchised outlets located at a distance from highways. We also present the regression results of the additional secondary proxies: playground presence, and wireless connection offered at the restaurant, and suggest that these characteristics are correlated with a higher outlet level of repeat customers.

As before, we test for a negative relationship between the level of prices and the proxies for a restaurant level of repeat business, and a negative relationship between the proxies and the changes in prices between 1999 and 2006. In the analysis below, we focus on the Big-Mac meal price. One advantage of using the the Big-Mac meal price is that restaurants owners are likely to consider the impact of the Big-Mac pricing decision more closely, and customers are likely to form expectations based on items they often buy. Moreover, the chain is likely to focus its monitoring efforts on primary items, such as the Big-Mac.

3.3.1 Within Franchised and Within Corporate-Owned Price Analysis

The following specification is used to test whether an outlet highway location can explain the price variation across franchised outlets and across corporate-owned outlets in 1999:

$$ln(p_{it}) = \alpha + \gamma * D_{repeat,i} + \delta * D_{franchised,it} + \eta * D_{repeat,i} * D_{franchised,it} + \beta * X_i + \theta * Comp_{it} + \epsilon_i \quad (2)$$

The dependent variable is the Big-Mac meal price in 1999, where $D_{repeat,i}$ is a dummy variable equal to 1 if outlet i is located at a distance from the highway. Note that the effect of an

[40] "Restaurant Business", 01/28/03.

outlet distance from the highway on price is γ in corporate-owned outlets, whereas it is $\gamma + \eta$ in franchised outlets.

We employ the secondary proxies separately and also as a combined proxy in four regressions. The results for the regressions are displayed in Table 7. When we use the distance from a highway as a proxy, we find that the price difference between a franchised outlet and a corporate-owned outlet located near a highway is 15.8%, whereas only 10.9% at outlets located at a distance from the highway. When we use the joint proxy, we find that prices at franchised outlets characterized by the joint proxy, i.e. located at a distance from the highway with a playground and offering a wireless service, were 2.6% higher than corporate-owned outlets characterized by the joint proxy, whereas franchised outlet not characterized by the joint proxy charged 14.9% higher prices than corporate-owned restaurants not characterized by the joint proxy. We obtain similar qualitative results in the separate regressions which utilize the playground and the wireless service availability proxies. Under the interpretation that an outlet location near a highway is a good proxy for few repeat customers, the observed price variation across franchised and corporate-owned outlets is consistent with the positive price externality interpretation; franchisees operating at locations characterized by more repeat customers have a higher incentive to internalize the externality, or alternatively, these franchisees find it less profitable to charge high prices and to degrade the chain's reputation.

We now turn to test the changes in the price premium between 1999 and 2006 at outlets characterized or not by the secondary set of proxies. We examine, for example, whether the price premium at outlets located near the highway, has fallen between 1999 and 2006 more than it fell at outlets located at a distance from the highway. We employ a Difference-In-Difference-In-Difference approach, and the specification is as follows:

$$\begin{aligned} ln(p_{it}) = \alpha + & \gamma_1 * D_{repeat,i} + \gamma_2 * D_{franchised,it} + \\ & \gamma_3 * D_{2006,i} + \gamma_4 * D_{repeat,i} * D_{franchised,it} + \\ & \gamma_5 * D_{repeat,i} * D_{2006,i} + \gamma_6 * D_{franchised,it} * D_{2006,i} + \\ & \gamma_7 * D_{repeat,i} * D_{franchised,it} * D_{2006,i} + \\ & \beta * X_{it} + \theta * Comp_{it} + \epsilon_{it} \end{aligned} \tag{3}$$

The results are shown in Table 8, and for the regression using the distance from the

highway dummy are demonstrated graphically in Figure 6.[41] As can be seen in the Figure, the franchisee's price premium was 16.1% (γ_2) in 1999 near the highway and it dropped to 4.6% ($\gamma_2 + \gamma_6$) in 2006. At outlets located at a distance from the highway, the premium was 11.1% ($\gamma_2 + \gamma_4$) in 1999 and only 3.3% ($\gamma_2 + \gamma_4 + \gamma_6 + \gamma_7$) in 2006. We can reject a joint F test for the three following hypotheses: ($\gamma_2 > 0; \gamma_2 + \gamma_4 > 0; \gamma_2 > \gamma_2 + \gamma_4$) as well as for the following joint test: ($\gamma_2 + \gamma_6 > 0; \gamma_2 + \gamma_4 + \gamma_6 + \gamma_7 > 0; \gamma_2 + \gamma_6 > \gamma_2 + \gamma_4 + \gamma_6 + \gamma_7$), but cannot reject each hypothesis separately. We obtain qualitatively similar results when we use the other proxies as well as the joint proxy. These results are, again, consistent with the interpretation that outlets with lower incentive to take the impact of their pricing decision on future sales were charging higher prices in 1999. Moreover, following the Dollar Menu introduction the profitability of maintaining the high prices was curtailed, and hence, the price difference between these outlets and outlets which initially charged lower price decreased.

In this Section, we focused on the prices and changes in prices of non-advertised items at outlets which adopted the Dollar Menu. We showed that these price differences have fallen between 1999 and 2006 only for items with good substitutes in the Dollar Menu. We interpret these results as suggesting that the Dollar Menu curtailed the profitability of high prices and that its impact was more significant with respect to franchisees who initially had a greater incentive to free-ride on the chain's reputation, such as at outlets located near highways. Before discussing alternative explanations for our findings, we present evidence that outlets at airports charge higher prices than non-airport restaurants and that these outlets are less likely to offer the Dollar Menu compared to non-airport restaurants.

3.4 Value Menu at U.S. Airports

In the previous section we provided several pieces of evidence that franchisees charged higher prices than corporate-owned outlets. To provide additional evidence on the decision whether to adopt the advertised low-prices[42] and its impact on prices, we present evidence on the availability of Value Menus at McDonald's and Burger-King restaurants located in U.S. airports.

[41] The Figure shows the relative prices of corporate-and franchised outlets at a given year and location. Thus, it does not reflect, for instance, the aggregate change in prices from 1999 to 2006 (γ_3).

[42] Note that the items included in the Value Menus are offered at all the airport restaurants, and we are only examining the prices of these items.

One interpretation for restaurants located at airports is that these restaurants serve very few repeat customers[43] and, thus, have little incentive to internalize the demand externality created by their pricing decision.[44] Thus, restaurants with little incentive to internalize the demand externality are more likely to choose not to offer the Dollar Menu at the price of disappointing their (few) repeat consumers.[45]

The comparison between airport and non-airport restaurants provides a clear distinction. Fifty nine out of 60 McDonald's restaurants and all Burger-King restaurants located in Santa Clara County offer the chain's corresponding Value Menu. On the other hand, none of the 41 McDonald's restaurants located at airports chooses to offer the Dollar Menu, and seven out of nine Burger-King restaurants located at airports do not offer Burger-King Value Menu. The average price (including tax) of a Double Cheeseburger at an airport restaurant is \$1.95 compared to an average price of \$1.12 at non-airport restaurants. Interestingly, the only two restaurants which adopt the Value Menu are corporate-owned restaurants. On the other hand, there are also 3 corporate-owned restaurants which do not. Another suggestive evidence that airport restaurants have fewer incentive to internalize the price externality is their usage of an airport employee discount. Nearly 80% of airport restaurants offer an airport employee discount. These discounts vary across outlets within an airport and typically depends on the price of the item.[46] If airport restaurants are able to distinguish between frequent customers and less frequent customers then their incentive to internalize the externality is further reduced. Table 9 displays the information on 41 McDonald's and 9 Burger-King airport restaurants located at U.S. airports.

The evidence from U.S. airports has three interrelated goals: first, it supports our

[43] A survey of 1900 departing passengers at Denver International Airport reports that, on average, passengers travel through the airport less than four times a year, suggesting that the level of repeat business at airports is considerably less than non-airport locations. The full report is available at *http : www.flydenver.com/diabiz/bizops/documents/concesSurvey.pdf*

[44] Airport restaurants may have little incentives to internalize the price externality for other reasons: The likelihood passengers will choose another airport or terminal because of the high price is not presumably low; Moreover, an airport passenger average income is relatively high implying higher search costs, compared to non-airport customers.

[45] The theoretical framework in Appendix A demonstrates this argument formally.

[46] The typical discount is calculated as a percentage share of the price, 5% - 10%, although some offer an absolute price discount. Some restaurants offer different discounts depending on the item price.

claim that franchisees weigh the costs and benefits of offering the advertised low-prices, and that franchisees are not forced by the chain to offer the advertised low-prices. Second, the fact that airport restaurants, which did not adopt the Value Menu, charge considerably higher prices for the non-advertised items than restaurants which adopted it is consistent with our interpretation that the Value Menu curtailed the profitability of higher prices. Finally, under the interpretation that airport outlets face fewer incentives to take the impact of their pricing decision on future sales into account, we can explain why airport restaurants have chosen not to adopt the advertised low-prices.

Nevertheless, airport restaurants may differ from non-airport restaurants based on other non-observable dimensions. Thus, the evidence is not as conclusive as the evidence on the price patterns at restaurants which adopted the Dollar Menu.

4 Alternative Explanations

To further support our conjectures, we discuss alternative explanations for the patterns found in the data and argue that these explanations are less plausible. We begin with alternative explanations for the observed price patterns at non-airport restaurants which adopted the Dollar Menu, and then discuss one alternative explanation why restaurants chose to adopt the Dollar Menu which is not driven by the advertising campaign.

4.1 Alternative Explanations for the Price Patterns

Before discussing potential explanations for the pricing patterns found in the data, it should be emphasized that using panel data with observations from the same geographic area enables us to rule out alternative explanations which rely on time-invariant unobservable price determinants. Thus, a possible alternative explanation should be based on a change in unobservables affecting differently franchised and corporate-owned outlets. Indeed, a shortcoming of previous empirical papers that have examined price and quality differences across corporate-owned and franchised outlets was their dependence on cross-section data rather than on panel data. The first alternative explanation below relates to the initial price difference between franchised outlets and corporate outlets. The latter two explanations relate to the change in prices between 1999 and 2006.

4.1.1 Higher costs at Franchised Outlets or Double Marginalization

To establish that the difference in prices across franchised outlets and corporate-owned outlets is driven by the fact that franchisees have fewer incentives compared to the chain to internalize the price externality, one should rule out alternative explanations which are based on franchised outlets incurring higher costs than corporate-owned outlets.[47] Importantly, McDonald's franchisees and the chain purchase their inputs from the same certified suppliers and at equal terms.[48] One potentially important cost difference is the royalties franchisees pay to the chain, which could result in a double mark-up and higher prices. Nevertheless, the royalties are determined based on total sales rather than on per-item sales. Thus, it is hard to explain the variation in the price premia across items solely on the basis of cost differences. Furthermore, any cost-based explanation for the higher prices at franchised outlets cannot explain the variation across franchised outlets as illustrated by our empirical analysis using the secondary set of proxies.

4.1.2 Decrease in The Demand for McDonald's Products

The observed changes in prices between 1999 and 2006 might be the result of a drop in demand for McDonald's products, particularly its beef products. Presumably, such a drop could lead to lower mark-ups for beef products, such as the Big-Mac Meal. In fact, over the past years, McDonald's has increased the variety of salads offered at its restaurants to fend off criticism over its, presumably, unhealthy menu. This change, however, only explains an overall drop in demand for McDonald's restaurants and does not explain the differential change at corporate and franchised restaurants, or the differences across franchised outlets characterized by the secondary set of proxies.

[47] Any cost explanation does not invalidate our interpretation that the advertising of low-priced items was the reason franchisees adopted these items.

[48] The 1968 U.S Supreme Court ruling in *Siegel v. Chicken Delight* bans chains from requiring franchisees to purchase inputs exclusively from the chain. Moreover, Krueger (1991) found evidence that McDonald's corporate-owned outlets offer higher wages compared to franchised outlets.

4.1.3 Change In McDonald's Franchisees' Contractual Agreement

A third alternative explanation might be a change in the contractual agreement between McDonald's and its franchisees: a decrease in the royalty fees charged by the chain may have caused franchisees to lower the prices they set relative to the prices charged in corporate-owned outlets. Franchisees confirm that there was no change in the contractual agreement in past years affecting royalties, and industry news reports do not mention such a change. Importantly, royalties are determined based on total sales rather than on on per item basis. Thus, even if a reduction in royalties occurred it cannot explain the observed changes in price premia across different items.

4.2 Why Did Franchisees adopt the Dollar Menu?

Imposing maximum price restraints or an explicit requirement by McDonald's to adopt the prices of Dollar menu campaign could have led to similar observable implications. Interestingly, the ability of a franchisor and a franchisee to agree on items' maximum resale price became legal in 1997 after the U.S. Supreme Court decision in *State Oil Company v. Khan*.[49] However, since franchised contracts are valid for 20 years, the impact of the Supreme Court decision may be limited. Indeed, conversations with McDonald's franchisees and employees confirm that McDonald's does not impose maximum resale prices on its franchisees, despite the legal change. Matthew Paull, McDonald's Corporation CFO said during a McDonald's Earnings Conference Call in January 2006: "bear in mind (that) we are required by law (not to) .. and we never ever try to influence their (franchisees) pricing".[50]

5 Discussion and Concluding Remarks

Economists and scholars from other fields devoted considerable effort to studying the relationship between manufacturers and retailers. Indeed, the ability of a manufacturer to influence

[49] In this decision, the U.S. Supreme Court overruled a previous decision from 1968 and determined that maximum price restraints should be examined under the *rule of reason standard* and not be considered as illegal *per-se*. For a detailed review of the legal history of maximum resale price restraints, see Blair and Lafontaine (1999).

[50] http://seekingalpha.com

retailers' prices and to align their incentives with those of the manufacturer have a direct impact on profitability and performance. In this paper, we analyze this relationship by investigating the largest franchising chain, McDonald's, and its ability to influence the prices at McDonald's franchised outlets. Our main idea is that advertising can be used to inform consumers about low-prices, thereby inducing franchisees to adopt the advertised low prices and improving the chain's control over its franchises.

The relationship between a chain and its franchisees is also a typical example of a principal-agent relationship. Interestingly, the misalignment of incentives between a chain and its franchisees can be described as an example of the model developed by Baker (1992). In his model, the performance measure of the agent (franchisee's profits) do not accurately reflect the principal objective (the chain's overall profit), and the principal cannot directly monitor the agent's behavior. Consequently, contractual inefficiencies can arise. Thus, our basic idea on the role of advertising or, more generally, information-disseminating mechanisms, can be generalized to other examples of principal-agent relationships, in which a third party disciplines the behavior of agents. For example, shipping companies post signs on their trucks asking drivers to report their truck drivers if they are driving carelessly; retailers offer rewards to consumers who report cashiers' misbehavior. Future research can examine the role of these additional information-disseminating mechanisms in improving an organization ability to monitor its agents.

To explore our idea in the context of the franchising industry, we examine how McDonald's Dollar Menu advertising campaign affected prices at McDonald's franchised and corporate-owned outlets. We find that before McDonald's Dollar Menu advertising campaign, franchisees charged higher prices than corporate-owned outlets and that this price premium has dropped only for items with good substitutes in the Dollar Menu. For example, in 1999 the price of the Big-Mac meal at franchised outlets was 12.4% higher than at corporate-owned outlets and only 3.6% in 2006, whereas the price premium of the Fillet-O-Fish remained stable over the same time period. We also show that the price differential between franchised and corporate-owned outlets was larger near highways and that the price premium in these locations has fallen more, compared to locations at a distance from the highway. These findings suggest that the advertised low-prices curtailed the profitability of franchisees' free-riding be-

havior and that through advertising, the chain improved its control over franchisees' pricing behavior.

Hence, our results suggest that alternative theories which are commonly used to explain how principals control the behavior of agents, even with no explicit incentives, such as efficiency wages or self-enforcement theories, are not sufficient to ensure that franchisees adhere to the chain's optimal decisions.

Finally, our paper provides an example of the role of advertising in building a chain's reputation and in improving the chain's control over its franchisees. Typical explanations for the role of advertising focus on non-organizational motivations. Clearly, advertising campaigns may entail strategic as well as organizational motivations, and the successful implementation of such campaigns may depend on the reputation of the advertiser. It will be interesting to explore how these conventional roles of advertising interact with the organizational role offered here as well as how our empirical findings on the prices of advertised and non-advertised items fit alternative theories of price-advertising.

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6 Appendix A - Theoretical Framework

The main objective of the framework is to illustrate how low-price advertising can impact the prices charged by franchisees, in particular, the prices of franchisees who operate in markets characterized by an intermediate level of incentive to internalize the demand externality. According to the suggested mechanism, the chain determines the level of advertising. Consumers

exposed to the advertised price expect to be offered the advertised price and will not buy the product otherwise. Franchisees, realizing that customers' preferences have changed, will set prices which maximize their post-advertising profits. Hence, the level of advertisement is chosen, such that franchisees' post-advertisement decisions will be more aligned with the chain's objective. A basic distinction between the framework developed here and previous models of price and advertising is that the advertising and pricing decisions are not determined simultaneously, and, in fact, are determined by different entities. The chain determines the level of advertisement, and the franchisees set the prices in their outlets.

To illustrate the suggested mechanism and derive testable implications, we compare three alternative settings. First, we solve a pre-advertising equilibrium in which the chain neither advertises nor is able to set prices. We then compare this equilibrium to a setting in which the chain sets the prices and demonstrate that a price-setting chain would only change the prices at restaurants which have an intermediate level of incentive to internalize the demand externality. Finally, we solve for an advertising equilibrium, in which a chain advertising decision indirectly affects franchisees' pricing decisions. We then compare the equilibria outcomes and derive testable predictions.

6.1 Setup

A chain operates in many distinct markets, and one franchisee operates in each market. A market is denoted by $\theta \in [0,1]$, and each franchisee sets the price, P_θ, of a good to maximize her outlet profits in a single period.[51] The marginal cost to produce the good is assumed to be 0. There are $g(\bar{P})$ potential consumers in each market, where $g(\bar{P})$ denotes the chain's reputation, a positive decreasing function of $\bar{P}$, the average price set by all franchisees.[52]

Each potential consumer has a unit demand and complete information on the prices charged by the franchisee operating in his market. There are two types of potential customers. The first consists of customers characterized by a high willingness to pay, V, for the good,

[51] Extending the framework to two periods does not change the qualitative results.

[52] The reputation function can be interpreted in several ways; for example, it could represent the brand name of the chain and how it appeals to consumers. Alternatively, it could can have a strategic interpretations, i.e. the chain's reputation of engaging in price wars with potential entrants. See Kreps and Wilson (1982) and Milgrom and Roberts (1982).

and the others by a low willingness to pay customers, R, where ($V > R$). θ denotes the proportion of the former type in a market and $1-\theta$ the proportion of low willingness to pay customers. Consumers obtain their utility of the good minus the price if they buy and 0 otherwise. Franchisees cannot distinguish between consumers but know the distribution of customers' types in their market. $\xi_{g,\bar{P}}$ denotes the chain's reputation elasticity with respect to the average price, i.e. $\xi_{g,\bar{P}} = \frac{\partial g(\bar{p})}{\partial \bar{p}} \frac{\bar{p}}{g(\bar{p})}$. The chain profits are determined as a fixed share of the franchisees' profits, and for simplicity, we assume that this share is equal to 1.[53] Repeat customers are comprised of two subgroups: a constant fraction of the repeat customers, β, will return to the same outlet, and the remaining share of repeat customers, $1-\beta$, will potentially revisit other outlets of the chain. Thus, an outlet demand externality, or the impact on other outlet sales is a function of $(1-\beta)(1-\theta)$, a decreasing function of θ. Thus, the larger is θ, the smaller is the impact on other outlets sales, and indirectly on the chain profits. Since incorporating β neither change the analysis nor the results, we ignore it in the analysis.

6.1.1 Pre-advertising Equilibrium

A franchisee considers the chain's reputation to be given and maximizes profits by choosing the optimal price given the proportion of low-willingness-to-pay customers she serves. Specifically, she adopts the following decision rule:

$$P_\theta = \begin{cases} R & \text{if } \theta \in [0, \frac{R}{V}] \\ V & \text{otherwise.} \end{cases}$$

Let $\bar{\theta}_f$ be the threshold market, i.e. the market in which a franchisee is indifferent whether to set the price to V or R. Thus, $\bar{\theta}_f = \frac{R}{V}$, the average price is given by: $\bar{P} = R\bar{\theta}_f + (1-\bar{\theta}_f)V = (R-V)\bar{\theta}_f + V$, and the chain profits are:

$$\Pi_f = g(\bar{P}) \int_0^{\bar{\theta_f}} R d\theta + g(\bar{P}) \int_{\bar{\theta_f}}^1 \theta V d\theta \tag{4}$$

[53] To capture the notion of demand externality in a particular market it is convenient to think of the proportion of customers with a high willingness to pay, θ, as customers who are unlikely to repeat any of the chain outlets and of $1-\theta$ as the proportion of customers in a market whose decision to revisit the chain is affected by the price. The two groups of customers can differ based on their search costs or based on the frequency they purchase the good.

6.1.2 Chain Equilibrium

The chain chooses its threshold market $\bar{\theta}_c$ by solving -

$$\max_{\bar{\theta}} \int_0^{\bar{\theta}} g(\bar{P})Rd\theta + \int_{\bar{\theta}}^1 g(\bar{P})\theta V d\theta \tag{5}$$

Importantly, the chain, unlike franchisees, internalizes the externality created by each individual price on the average price and indirectly on the reputation of the chain. The chain's first-order-condition is:

$$\xi_{g,\bar{P}} = \frac{(\bar{\theta}_c V - R)((R-V)\theta_c + V)}{(R-V)(R\bar{\theta}_c + \frac{1}{2}V(1-\bar{\theta}_c^2))} \tag{6}$$

We can now derive the first proposition:

Proposition 1 $\overline{\theta}_f < \overline{\theta}_c < 1$ - *The price-setting chain's optimal threshold, $\overline{\theta}_c$, is larger than the pre-advertising equilibrium threshold, and smaller than 1.*

Proof. To show that $\overline{\theta}_c < 1$, note that in the market characterized by $\theta = 1$ it is always optimal to set the price equal to V, since all consumers will buy the good and the average price is not affected, i.e. $g(\bar{P})R < g(\bar{P})V$. To show that $\overline{\theta}_f < \overline{\theta}_c$, recall that, by assumption, $g(\bar{p})$ is decreasing in the average price, $\bar{p}$, and hence $\xi_{g,\bar{P}}$ is negative. The denominator on the right-hand side of (3) is negative since $R < V$, and the nominator is positive only if $(\bar{\theta}_c V - R) > 0$, or equivalently that $\overline{\theta}_f = \frac{R}{V} < \overline{\theta}_c$. ■

One implication of this result is that even the chain chooses to set high prices in markets with a large proportion of high-willingness-to-pay customers. In these outlets the chain benefits from the large revenues generated more than it suffers from the damage to its reputation. Hence, the framework can shed light why empirical papers have found that outlets operating at remote locations are operated by franchisees rather than by the chain.

6.1.3 Advertising Equilibrium

The advertising technology alters the preferences of high-willingness-to-pay costumers to the preferences of low willingness to pay customers. A high-willingness-to-pay customer who is exposed to the advertising will buy the good for a price no higher than R. The proportion of

converting customers, α, depends on the level of advertising, and the chain cannot advertise in selected markets. We assume an interior solution for advertising, implying that a positive level of advertising is profitable. To find the optimal level of α, we derive the optimal decision rule of a franchisee given α, and utilize this decision rule in the chain's advertising decision. The franchisee decision rule is:

$$P_\theta(\alpha) = \begin{cases} R & \text{if } \theta \in [0, \frac{R}{V(1-\alpha)}] \\ V & \text{otherwise.} \end{cases}$$

Let $\bar{\theta}_a$ be the threshold advertising market, i.e. the market in which a franchisee in an advertising equilibrium is indifferent about whether to set price to V or R. Note that the choice of α, determines the threshold advertising market, $\bar{\theta}_a = \frac{R}{V(1-\alpha)}$; the average price $\bar{P} = R\bar{\theta}_a + (1-\bar{\theta}_a)V = (R-V)\bar{\theta}_a + V$ and the chain reputation. The advertising chain objective function is given by:

$$\begin{aligned} &\max_{\bar{\theta}} \int_0^{\bar{\theta}} g(\bar{P})Rd\theta + \int_{\bar{\theta}}^1 g(\bar{P})\theta V(1-\alpha)d\theta - C(\frac{V\bar{\theta}-R}{V\bar{\theta}}) \\ &s.t. \qquad \bar{\theta} = \frac{R}{(1-\alpha)V} \end{aligned} \tag{7}$$

The advertising chain f.o.c is given by:

$$g'(\bar{P})R(R-V)(\frac{1+\bar{\theta}^2}{2\bar{\theta}}) - g(\bar{P})\frac{R(1-\bar{\theta}^2)}{2\bar{\theta}^2} = C'(1-\frac{R}{\bar{\theta}V})\frac{R}{\bar{\theta}^2 V} \tag{8}$$

We can now derive the second proposition:

Proposition 2 $\Pi_c(\bar{\theta_c}) > \Pi_a(\bar{\theta_a}) > \Pi_f(\bar{\theta_f})$ - *The chain's profits under the price-setting equilibrium are larger than its profits under the advertising equilibrium, which are larger than the profits under the pre-advertising equilibrium.*

Proof. We prove the first inequality in three steps: First, we show that $\Pi_c(\theta) > \Pi_a(\theta)\ \forall\theta < 1$. This inequality holds because franchisees who charge V in the advertising equilibrium sell only to $(1-\alpha)\theta$ consumers and generate less profit than the same franchisees in the price-setting chain equilibrium who sell to θ consumers. By the optimality of the price setting chain decision, we know also that $\Pi_c(\bar{\theta_c}) \geq \Pi_c(\bar{\theta_a})$ and that $\bar{\theta}_c < 1$. Thus, we obtain that $\Pi_c(\bar{\theta_c}) \geq \Pi_c(\bar{\theta_a}) > \Pi_a(\bar{\theta_a})$. $\Pi_a(\bar{\theta_a}) > \Pi_f(\bar{\theta_f})$ holds for any interior advertising solution. ■

The implication of Proposition 2 is that advertising cannot completely eliminate franchisees' incentive problem, even if the cost of advertising is 0. The following proposition establishes our testable predictions.

Proposition 3 $\bar{\theta}_f < \bar{\theta}_a < 1$ - *The franchisee, who is indifferent to charging V or R in the advertising equilibrium, operates in a market where the proportion of low-willingness-to-pay customers is higher than $\theta = 1$ and lower than $\bar{\theta}_f$, the threshold level in the pre-advertising equilibrium.*

Proof. The first inequality is a direct implication of our assumption that advertising is profitable. To prove the second inequality, recall that $\bar{\theta}_a = \frac{R}{V(1-\alpha)}$, or alternatively that $\frac{V\theta - R}{V\theta} = \alpha$. Choosing $\theta_a > 1$ is not profitable, since the chain can reduce its level of advertising and its advertising costs, and at the same time its reputation, and franchisees' pricing decisions will not change. We prove that $\theta_a < 1$ by contradiction. Assume that the advertising level induces the franchisee operating in the market where $\theta = 1$ to be indifferent between high and low prices, implying $\bar{\theta_a} = 1$ or that $\frac{V-R}{V} = \bar{\alpha}$. We show that by choosing $\bar{\alpha} - \epsilon < \bar{\alpha}$, the chain increases its profits. To observe that, note that the chain's reputation will not change if only the marginal franchisee charges a higher price. Moreover, the franchisee operating in the market where $\theta = 1$ is no longer indifferent between low and high prices and will profit more by charging V. Finally, the cost of advertising also drops. Contradiction. ■

We derive two additional propositions. The first proposition shows that consumer surplus under the advertising equilibrium is larger than the consumer surplus in the pre-advertising equilibrium, and the second proposition contains the condition under which all the franchisees benefit from advertising. For both propositions we maintain the assumption that advertising is profitable, i.e. $\bar{\theta}_a > \bar{\theta}_f$ which implies $\bar{P}_f > \bar{P}_a$

Proposition 4 *Consumer surplus in the advertising equilibrium is larger than consumer surplus in the pre-advertising equilibrium.*

Proof. Note that the only consumers who obtain a positive utility are consumers with high willing to pay who bought the good for the price of R. In the pre-advertising equilibrium, the consumer surplus is given by $\int_0^{\bar{\theta}_f} (V - R) g(\bar{P}_f) \theta d\theta$, whereas in the advertising equilibrium it is

given by $\int_0^{\bar{\theta}_a}(V-R)g(\bar{P}_a)(1-\alpha)\theta d\theta$. Using our pervious results that $\bar{\theta}_f = \frac{R}{V}$ and $1-\alpha = \frac{R}{\theta_a V}$, we can compare the two expressions for the consumer surplus and simplify the inequality to $\bar{\theta}_a g(\bar{P}_a) > \frac{R}{V} g(\bar{P}_f)$. However, this inequality holds for $\bar{\theta}_a > \bar{\theta}_f$. ■

Proposition 5 *Franchisees characterized by $\theta \leq \bar{\theta}_f$ always benefit from advertising. All franchisees characterized by $\theta > \bar{\theta}_f$ also gain from the advertising of low-prices if $(1-\alpha)g(\bar{P}_a) > g(\bar{P}_f)$. Otherwise, some incur losses.*

Proof. We consider first the lower interval of θ, $\theta \leq \bar{\theta}_f$. In the advertising equilibrium, restaurants characterized by low θ will set the price, R, as they set in the pre-advertising equilibrium but will sell to more consumers since the chain reputation increased $g(\bar{P}_a) > g(\bar{P}_f)$. For restaurants characterized by $\theta \geq \bar{\theta}_f$ we note that a franchisee profits in the pre-advertising equilibrium are increasing in θ. Thus, we derive the condition under which the franchisee who will lose the most, i.e. $\theta = 1$ will still gain from advertising. In the pre-advertising equilibrium, her profits are $g(\bar{P}_f)V$. Once advertisement is introduced she still charges the price V, and her profits are given by $(1-\alpha)g(\bar{P}_a)V$. The advertising equilibrium profits are higher if $(1-\alpha)g(\bar{P}_a) > g(\bar{P}_f)$. ■

7 Appendix B - Survey Results

The survey was conducted among 104 undergraduate students at Stanford University in late April 2007.[54] The survey and a summary of the responses are presented in Figure 5 and Table 12.

Among the 56 respondents who chose Big Mac meal as their first choice, 46 (82.1%) switched to a Dollar Menu option once it was offered to them. On the other hand, only 25 (53.1%) out of the 47 respondents who chose Chicken McNuggets switched to a Dollar Menu option. We perform group mean comparison tests and reject in 1% significance level the null hypothesis that the percentage of respondents who switch to Dollar Menu option is the same for respondents that choose Big-Mac meal and for those who choose Chicken McNuggets.[55]

[54] To control for price changes in the Big-Mac meal and the Chicken McNuggets meal that occurred following the introduction of the Dollar Menu we utilize prices from the only outlet in Santa Clara county that did not introduce the Dollar Menu.

[55] We reject the null hypothesis even when we test for mean difference over respondents that visit McDonald's

Table 1: Ownership Structure and Exit/Entry Patterns

	1999		Exit		Entry		2006	
	Corp.	Fran.	Corp.	Fran.	Corp.	Fran.	Corp.	Fran.
Jack-in-the-Box	29	6	1	2	2	2	30	6
McDonald's	22	39	1	5	2	4	23	37

The Table presents entry and exit patterns of McDonald's and Jack-In-the-Box in Santa Clara County, divided into franchised and corporate-owned outlets.

Table 2: Outlet Characterization by Secondary Proxies - 2006

Proxy	Corporate-Owned Outlets	Franchised Outlets
Far from Highway	16	30
Playground	8	15
Wireless Service	19	27
All Proxies Combined	6	7
N	23	37

The Table presents the number of outlets characterized by the secondary set of proxies in 2006. Outlets are divided by ownership structure. For example, in 2006 six out of the twenty three corporate-owned outlets are located not near a highway, have playgrounds and have wireless connectivity. Furthermore, only seven out of the thirty seven franchised outlets have all these properties.

at least few times a year.

Table 3: Summary Statistics - Big-Mac Meal Price in Santa Clara County

	Santa Clara County (1999)		Santa Clara County (2006)	
	Corporate	Franchised	Corporate	Franchised
Mean	3.33	3.77	4.69	4.92
Std.	0.26	0.29	0.13	0.18
Min.	3.24	3.24	4.32	4.65
Max.	4.43	4.43	4.87	5.52
N	22	39	21	37

The Table presents descriptive statistics for the (with tax) nominal Big-Mac meal prices that were collected in July 1999 and July 2006 from all McDonald's outlets in Santa Clara County. Franchisee's price premium, defined as the difference between the average franchised price and the average corporate price, decreased from 41 cents in 1999 to 22 cents in 2006. The standard deviation of the Big-Mac meal price dropped from 24 cents and 27 cents in 1999 for corporate-owned and franchised outlets to 12 cents and 17 cents in 2006, respectively.

Table 4: Franchisees' Premium for the Big-Mac Meal - Full Estimation Results

Dependent Variable	Big Mac Meal	Dependent Variable	Big Mac Meal
D_{2006}	0.348***	$Median-Household-Income$	0.0126
	(0.016)		(0.063)
$D_{franchised}$	0.1242***	$Median-Contract-Rent$	-0.059
	(0.021)		(0.068)
$D_{2006} * D_{franchised}$	-0.0881***	$Dineout-Spending-Potential-Index$	0.0006**
	(0.018)		(0.003)
$Close-Competitors$	-0.0069	$Seats$	0.00001
	(0.011)		(0.00001)
$Far-Competitors$	-0.0017	$Mall$	-0.0762
	(0.0068)		(0.049)
$Drive-Thru$	0.0142	$Playground$	-0.0108
	(0.012)		(0.013)
R^2	0.89	N	117

Standard errors are in parenthesis. Errors are clustered by outlet.

** significant at 5% confidence level, *** significant at 1% confidence level.

The Table contains the full set of estimators from specification 1. The dependent variable is the logarithm of the Big-Mac meal price. It shows that the franchisee's premium has significantly decreased from 12.42% in 1999 to 3.61% in 2006. Moreover, the coefficients on the competition proxies, defined as the number of chain affiliated hamburger outlets located within 0.1 mile and between 0.1 to 0.5 are insignificant determinants of the Big-Mac meal price.

Table 5: Franchisees' Premium

Dependent Variable	Big Mac Meal	Double Quarter Pounder Meal	Quarter Pounder Meal	Fillet-O-Fish Meal	McNuggets 6 pc.	McNuggets 20 pc.
D_{2006}	0.348***	0.26***	0.1***	0.247**	0.21***	0.11***
	(0.167)	(0.014)	(0.015)	(0.011)	(0.026)	(0.011)
$D_{franchised}$	0.1242***	0.074***	0.072***	0.026**	0.051***	0.021
	(0.021)	(0.017)	(0.017)	(0.012)	(0.012)	(0.014)
$D_{2006} * D_{franchised}$	-0.0881***	-0.0461**	-0.0614***	-0.012	0.006	0.0107
	(0.018)	(0.019)	(0.0182)	(0.015)	(0.028)	(0.013)
R^2	0.89	0.88	0.53	0.91	0.84	0.78
N	117	96	96	113	90	93

Standard errors are in parenthesis. Errors are clustered by outlet.

** significant at 5% confidence level, *** significant at 1% confidence level.

The Table contains the coefficients of the franchisee's premium in 1999 and the change in the premium from 1999 to 2006 for all meals offered both in 1999 and in 2006. Each column presents regression results using logarithm of a different meal price as the dependent variable. For all the meals, the price at franchised outlets was significantly higher in 1999. The price premia across franchised and corporate-owned outlets have fallen in 2006 only for a subset of the meals: the Big Mac meal; Quarter Pounder meal and Double Quarter Pounder meal. For example, the price premium for the Big-Mac meal has fallen by almost 9%. The price premium for the remaining meals (i.e. McNuggets meals and the Fillet-O-Fish meal) have not significantly changed.

Table 6: Franchisees' Premium for Jack-in-the-Box Signature Meal

Dependent Variable	Jumbo Jack Meal
D_{2006}	0.195***
	(0.005)
$D_{franchised}$	0.0568***
	(0.0204)
$D_{2006} * D_{franchised}$	-0.0581**
	(0.024)
R^2	0.94
N	71

Standard errors are in parenthesis. Errors are clustered by outlet.

** significant at 5% confidence level, *** significant at 1% confidence level.

The Table contains coefficients of franchisee's premium in 1999 and the change in the premium from 1999 to 2006 using the logarithm of Jumbo Jack meal price as the dependent variable. Jumbo Jack is Jack-in-the-Box signature dish, the equivalent to McDonald's Big-Mac. The main finding is that between 1999 and 2006 the price premium for the Jumbo Jack has disappeared. Jack-in-the-Box Value meal (The Dollar menu equivalent) was introduced in late 2001.

Table 7: Big-Mac Meal Price Patterns by Secondary Proxies (1999)

Proxy	Far From Highway	Playground Presence	Wireless Service	All Proxies Combined
D_{repeat}	0.036	0.033	0.048	0.061
	(0.039)	(0.035)	(0.049)	(0.037)
$D_{franchised}$	0.158***	0.146***	0.175***	0.149***
	(0.043)	(0.03)	(0.052)	(0.025)
$D_{repeat} * D_{franchised}$	-0.049	-0.058	-0.066	-0.124**
	(0.05)	(0.045)	(0.058)	(0.049)
R^2	0.56	0.56	0.56	0.61
N	52	52	52	52

Standard errors are in parenthesis. Errors are clustered by outlet.

** significant at 5% confidence level, *** significant at 1% confidence level.

The Table presents the regression results examining how the 1999 Big-Mac meal price varied across outlets characterized by the secondary set of proxies. Each column contains a separate regression results using a different proxy, i.e. in the first column the dummy variable is equal to one if the outlet is located at a distance from a highway; in the second if there is a playground on-site, and in the third column if wireless service is available. The fourth column is a combination of all three proxies. When we use the highway proxy, we obtain that franchisees' prices were 15.8% higher than corporate-owned outlets at outlets located near the highway, whereas only 10.9% higher at a distance from the highway. We can reject the null hypothesis that the price differences are zero within location, and cannot reject the hypothesis that the price premium across locations is the same. When we use the joint proxy, the price premium is 14.9% at outlets not characterized by the proxy, and only 2.6% higher at outlets characterized by the joint proxy. In this regression we can reject the null hypothesis that the price premium is the same across outlets characterized and not characterized by the proxy. Likewise, when we use the playground and wireless service proxies we get similar qualitative results.

Table 8: Big-Mac Meal Price Patterns by Secondary Proxies (1999 - 2006)

Proxy	Distance From Highway	Playground Presence	Wireless Service	All Proxies Combined
D_{repeat}, (γ_1)	0.034	0.029	0.036	0.056
	(0.026)	(0.039)	(0.024)	(0.057)
$D_{franchised}$, (γ_2)	0.161**	0.147**	0.154**	0.145***
	(0.031)	(0.016)	(0.021)	(0.015)
D_{2006}, (γ_3)	0.37**	0.359**	0.378**	0.364***
	(0.005)	(0.009)	(0.014)	(0.008)
$D_{repeat} * D_{franchised}$, ($\gamma_4$)	-0.05	-0.062	-0.039	-0.105
	(0.042)	(0.047)	(0.036)	(0.066)
$D_{repeat} * D_{2006}$, (γ_5)	-0.035	-0.028	-0.035	-0.057
	(0.026)	(0.039)	(0.023)	(0.055)
$D_{franchised} * D_{2006}$, ($\gamma_6$)	-0.115**	-0.103**	-0.12***	-0.104***
	(0.03)	(0.015)	(0.022)	(0.014)
$D_{repeat} * D_{franchised} * D_{2006}$,	0.038	0.041	0.041	0.074
(γ_7)	(0.041)	(0.044)	(0.032)	(0.056)
R^2	0.90	0.89	0.89	0.91
N	108	117	110	110

Standard errors are in parenthesis. Errors are clustered by outlet. ** significant at 1% confidence level.

The Table presents the results of the difference-in-difference-in-difference regression. The dependent variable is the Big-Mac meal price logarithm, and each column displays the results of a regression using a different secondary proxy. For example, in the first column, the dummy variable is equal to 0 if an outlet is located near a highway and 1 if it is located near a highway. The main finding derived from the highway proxy regression analysis is that franchisees' price premium for outlets located near the highway dropped significantly from 16.1% (γ_2) in 1999 to 4.6% ($\gamma_2 + \gamma_6$) in 2006. The price premium for outlets located at a distance from the highway fell significantly from 11.1% ($\gamma_2 + \gamma_4$) in 1999 to 3.3% ($\gamma_2 + \gamma_4 + \gamma_6 + \gamma_7$) in 2006. The results are demonstrated graphically in Figure 6. We can reject a joint F test for the three following hypotheses: ($\gamma_2 > 0; \gamma_2 + \gamma_4 > 0; \gamma_2 > \gamma_2 + \gamma_4$) as well as for the following joint test: ($\gamma_2 + \gamma_6 > 0; \gamma_2 + \gamma_4 + \gamma_6 + \gamma_7 > 0; \gamma_2 + \gamma_6 > \gamma_2 + \gamma_4 + \gamma_6 + \gamma_7$). Nevertheless, we cannot reject each separate hypothesis. Similar qualitative results are obtained when we utilize the other proxies.

Table 9: Characteristics of Airport Restaurants

	McDonald's		Burger-King	
	Fran.	Corp.	Fran.	Corp.
Restaurants	38	3	7	2
Value Menu	0	0	0	2
Airport Employee Discount	31	1	5	2

The Table presents characteristics of McDonald's and Burger-King airport restaurants located in U.S. airports. For example, there are 38 McDonald's franchised outlets, none of which offers the Dollar Menu and 31 offer an airport employee discount.

Table 10: Summary Statistics - Airport Restaurants

	Big-Mac Meal		Double Cheeseburger	
	Corp.	Fran.	Corp.	Fran.
Mean	5.23	5.92	2.07	1.93
Std.	0.35	0.54	0.25	0.37
Min.	5.03	4.81	1.81	1.35
Max.	5.65	6.92	2.29	2.85
N	3	35	3	35

The Table presents descriptive statistics for the (with tax) nominal Big-Mac meal and the Double Cheeseburger prices in McDonald's restaurants located in U.S. airports during September 2007. None of the airport restaurants offer the Dollar Menu and prices are significantly higher at airport restaurants compared to non-airport restaurants as presented in Table 3.

Table 11: Survey Response

	Big-Mac Meal	Chicken Mc-Nuggets	Double Cheese-burger Dollar Menu Meal	McChicken Dollar Menu Meal	Enlarged Double Cheese-burger Dollar Menu Meal	Enlarged Mc-Chicken Dollar Menu Meal
Big-Mac Meal	0.178	0	0.392	0.142	0.214	0.071
Chicken Mc-Nuggets	0	0.468	0.127	0.212	0.063	0.127

The Table contains a summary of the responses to the survey we conducted. The (i, j) entry of the table is the proportion of respondents that chose option j from the extended menu conditional on choosing option i from the base menu. While only 17.8% of the respondents that chose Big-Mac did not change their choice after the Dollar Menu options were added, 46.8% of the respondents that chose McChicken did not change their choice following the Dollar Menu options addition.

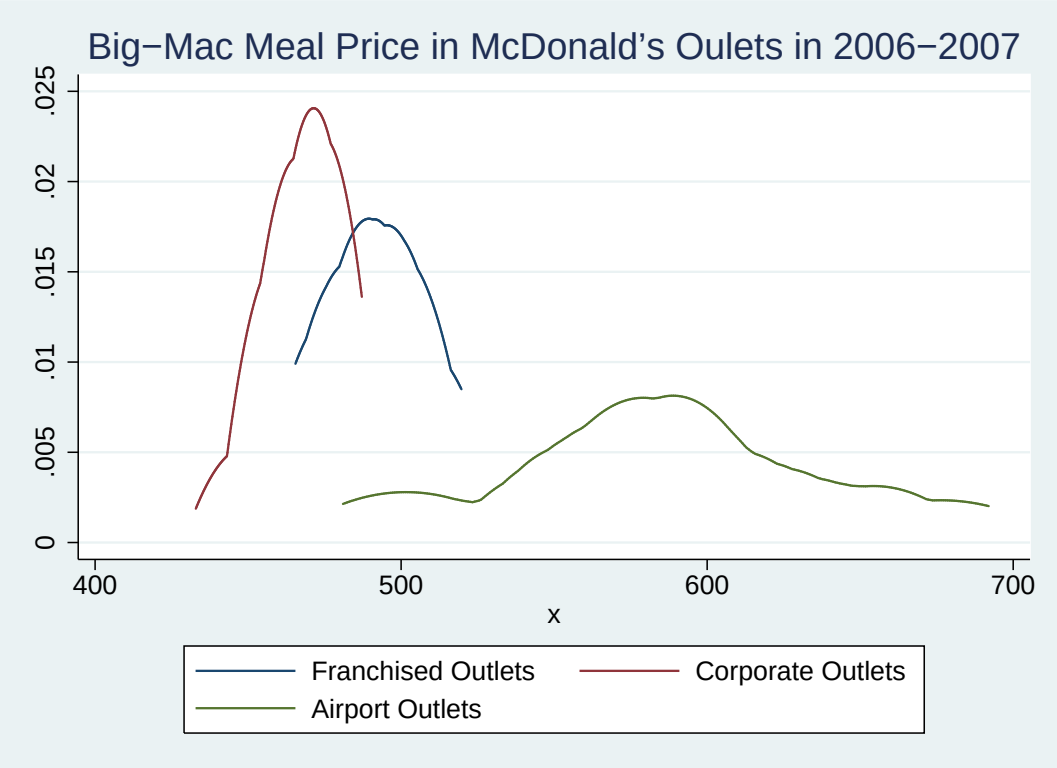

Figure 1: McDonald's Big-Mac Meal Price Distributions

The figure plots kernel density of Big-Mac meal price, estimated separately for airport restaurants in 2007, and non-airport franchised and corporate-owned outlets in 2006. The three type of restaurants exhibit distinct pricing patterns, even after the Dollar Menu introduction.

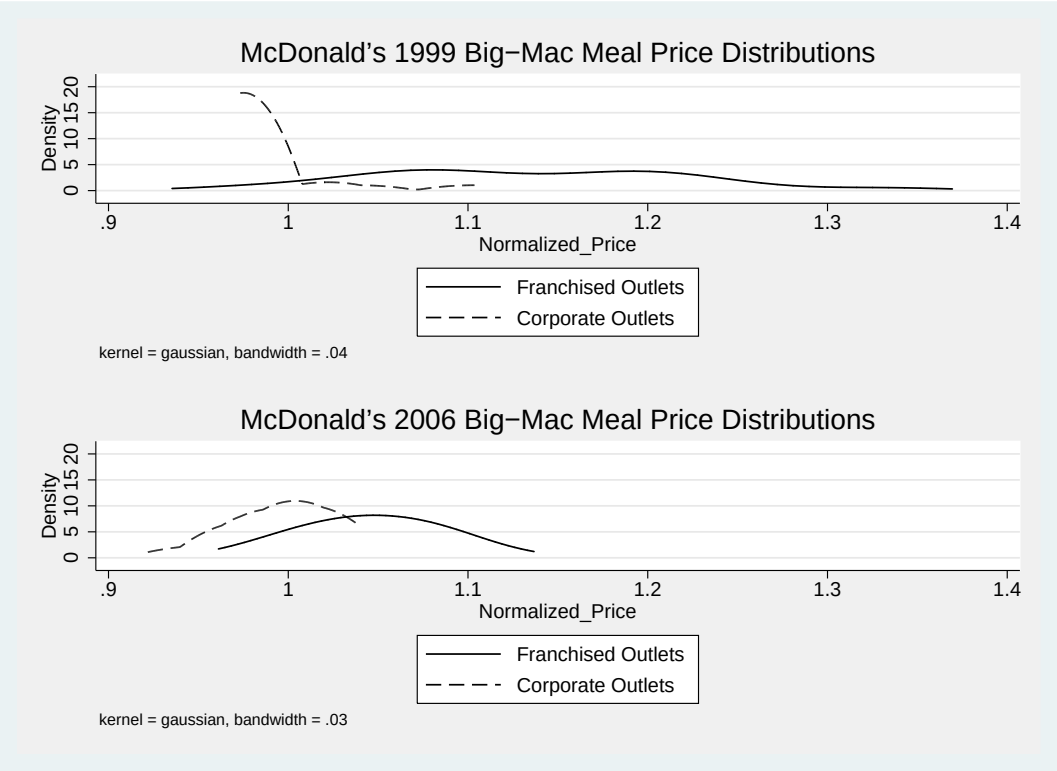

Figure 2: McDonald's Big-Mac Meal Price Distributions

The figure plots kernel density of Big-Mac meal normalized price, estimated separately for franchised and corporate-owned outlets for the time periods 1999 and 2006. An outlet normalized price is the ratio between the outlet nominal price and the average price set in corporate-owned outlets in the same year. The figure illustrates well how the two price distributions approach each other from 1999 to 2006.

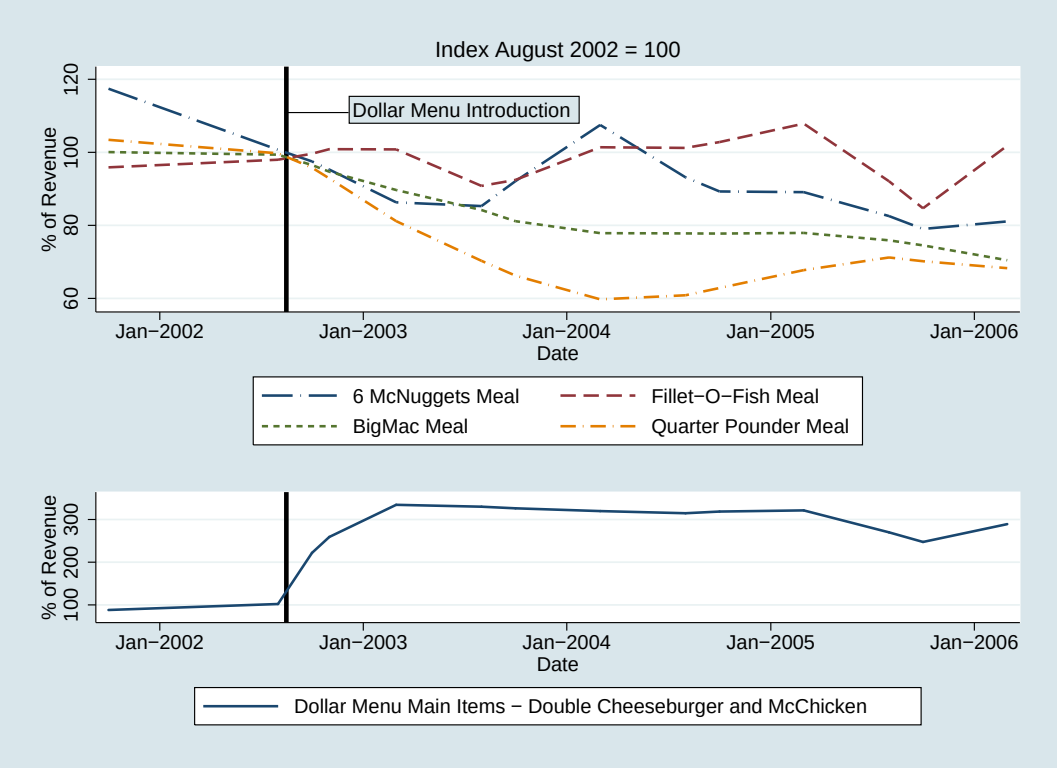

Figure 3: % of Revenue for Different Menu Items

The figure plots the evolution of monthly percentage revenue over the period Oct. 2001 - Mar. 2006 for different McDonald's menu items sold in a single franchised outlet. The percentage of revenue for each item was normalized to 100 by its August 2002 level. In the lower part of the figure we display the percentage of revenue of the Dollar Menu items: the Double Cheeseburger and the McChicken. The percentage of revenue for other menu items are shown in the upper part of the figure. The Dollar Menu introduction date in September 2002 is marked by a thick vertical black line.

The figure demonstrates two interesting patterns. First, the sales of the Dollar Menu items as a percentage of the revenue tripled in the observed period. Second, the sales of the Big-Mac meal and the Quarter Pounder meal as percentage of the revenue dropped abruptly after the Dollar Menu introduction, whereas the percentage revenue figures of the Fillet-O-Fish meal and the McNuggets meal remained relatively stable.

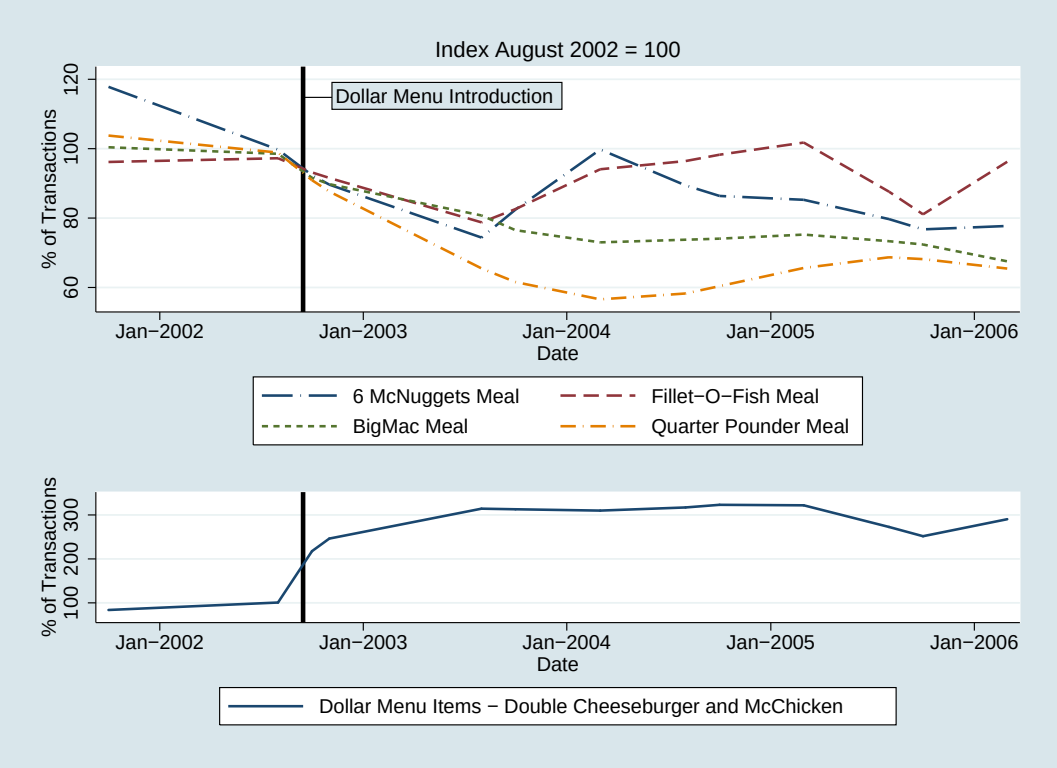

Figure 4: % of Transactions for Different Menu Items

The figure plots the percentage of transactions in which each of the items was purchased over the period of Oct. 2001 - Mar. 2006 in a single franchised outlet. The percentage of transactions for each item was normalized to 100 in August 2002. In the lower part of the figure we display the percentage of transactions of the Dollar Menu items: the Double Cheeseburger and the McChicken. The percentage of transactions for the regular menu items are shown in the upper part of the figure. The Dollar Menu introduction date in September 2002 is marked by a thick vertical black line.

The figure demonstrates two interesting patterns. First, the sales of the Dollar Menu as a percentage of the transactions tripled in the observed period. Second, the sales of the Big-Mac meal and the Quarter Pounder meal as percentage of the transactions dropped abruptly after the Dollar Menu introduction, whereas the percentage revenue figures of the Fillet-O-Fish meal and the McNuggets meal remained relatively stable.

Hi Students,

We are running a study on individuals' fast food preferences, and would highly appreciate your help in filling the short questionnaire below.

Note that there are no right or wrong answers, your participation is voluntary.

You enter a McDonald's restaurant and need to choose among the following two available standard meals (each containing an entrée + medium fries + medium soda)

A. Big Mac Meal ($4.59)
B. Chicken McNuggets (6 piece) Meal ($4.29)

1. Which one of the four meals above would you choose? ___

The next time you enter a McDonald's outlet you discover that McDonald's introduced two new Dollar Menu Meal options.

Dollar Menu Meal can be one of two options:
- Dollar Menu Meal - one small entrée + medium fries + medium soda for $3.00
- Enlarged Dollar Menu Meal - two small entrées + medium fries + medium soda for $4.00

Therefore, you now have the following six options to choose from (two regular meals and four Dollar Menu Meals):

A. Big Mac Meal ($4.59)
B. Chicken McNuggets (6 piece) Meal ($4.29)
C. Double Cheeseburger Dollar Menu Meal – Double Cheeseburger + medium fries + medium soda ($3.00)
D. McChicken Dollar Menu Meal - McChicken + medium fries + medium soda ($3.00)
E. Enlarged Double Cheeseburger Dollar Menu Meal – Two Double Cheeseburgers + one medium fries + one medium soda ($4.00)
F. Enlarged McChicken Dollar Menu Meal – Two McChicken + one medium fries + one medium soda ($4.00)

2. Which option would you choose? ____

3. In case your preferred option is not available, which other option would you choose instead? _____

4. How often do you eat at McDonald's or other fast food chains?

1. Once a week or more
2. Once a month or more
3. A few times a year
4. Hardly ever or never

Answer: ____

Thank you for your cooperation!

Figure 5: Survey

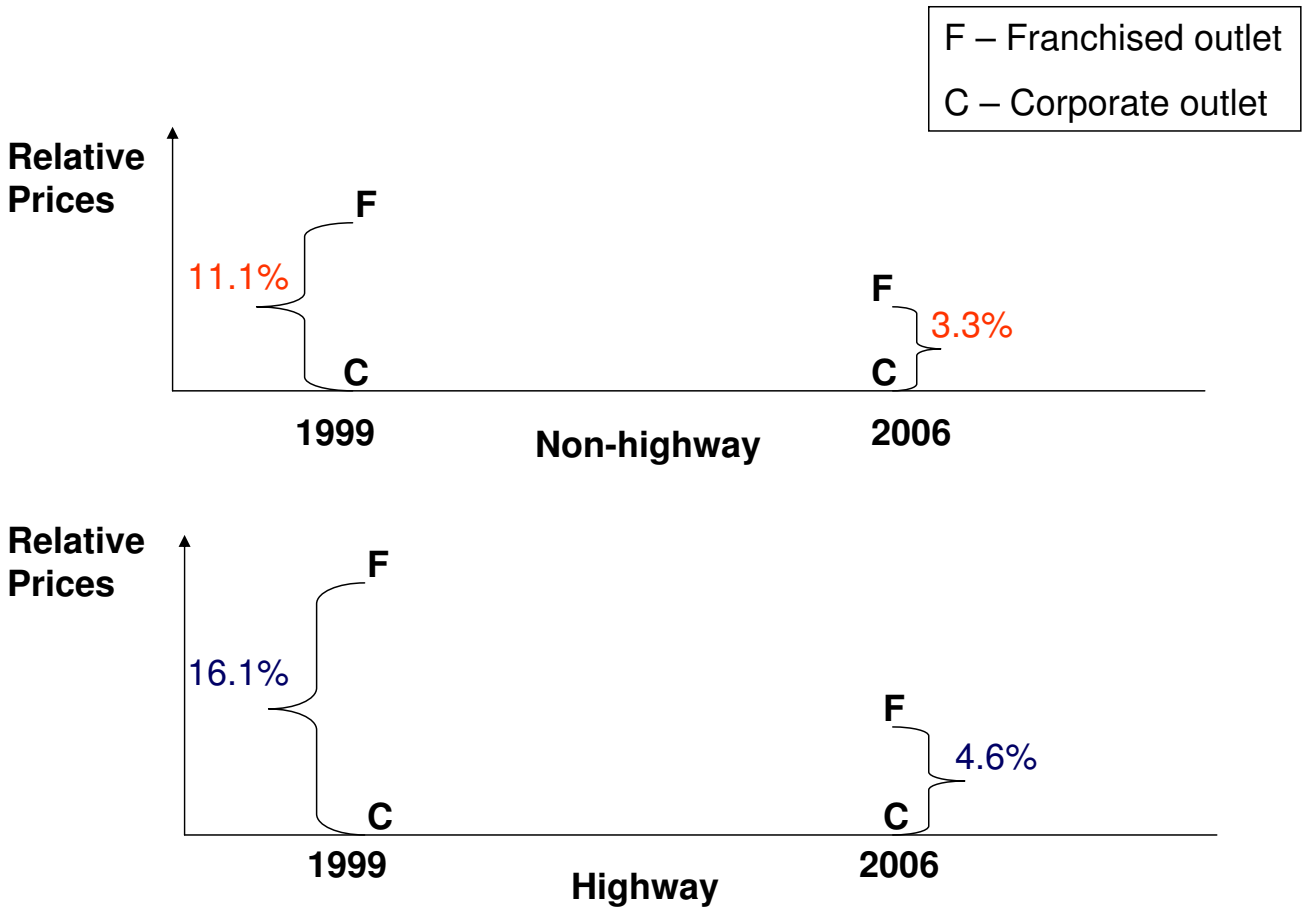

Figure 6: Dif-in-Dif-in-Dif Regression using the Highway Proxy

The figure displays the relative prices of a Big-Mac meal offered at a franchised and at corporate-owned outlets at a given year and a given location (near a highway or at a distance from the highway). The relative prices are derived from the difference-in-difference-in-difference regression presented in Table 8. For example, in 1999, a Big-Mac meal price at a franchised outlet near the highway was 16.1% (γ_2) higher than a corporate-owned outlet near the highway. The difference has dropped to 4.6% ($\gamma_2 + \gamma_6$) in 2006. At outlets located at a distance from the highway, the premium was 11.1% ($\gamma_2 + \gamma_4$) in 1999 and only 3.3% ($\gamma_2 + \gamma_4 + \gamma_6 + \gamma_7$) in 2006.