Big Driving out Small: 'Hypermarts' and the Retail Gasoline Industry

Jedidiah Brewer
Department of Economics
University of Arizona

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Abstract

The last half-century has seen the emergence of big-box stores, supermarkets, discount stores, and mass-merchandisers. Wal-Mart is the most notable. The growth of firms such as Wal-Mart has been met with much controversy as smaller, often more nostalgic competitors have faded away. Over the last decade, Wal-Mart and others have entered the US retail gasoline industry. They have been termed by industry players as hypermarts. This paper adds to the literature on big-box stores by analyzing the effect of hypermart entry on traditional gasoline retailers. The retail gasoline industry is ideal to identify the impact because gasoline is a relatively homogeneous good and is sold in very localized markets. I first develop a discrete-choice, random utility model to motivate the incentives for hypermarts to sell gasoline. I then estimate the price impact that hypermarts have on traditional gasoline retailers in two geographically diverse cities. I also examine the entry of The Home Depot into the retail gasoline market in Nashville, TN. I find that hypermarts do in fact place statistically and economically significant downward pressure on the prices of nearby gas stations. The magnitude of the price impact implies the entrance of a hypermart into a local market will cut an average gas station's profit in half. The findings reaffirm others who have noted the sizable impact large, low-priced firms have on their smaller competitors.

SECTION 1: Introduction

The latter part of the twentieth and the early years of the twenty-first centuries have seen the emergence of big-box retailers, discount stores, supermarkets, and mass-merchandisers. These large retailers have exploited economies of scale and scope in an effort to provide consumers with the lowest possible prices and the convenience of one-stop-shopping; yet the emergence of these retailers has come with much controversy. Wal-Mart is perhaps the most notable example of these types of stores, the escalating trend of industry concentration, and the controversy that surrounds it. Hausman and Leibtag (2005) examined the increased compensating variation that has arisen from Wal-Mart's expansion and find it to be so large that they conclude the entry of Wal-Mart into a local market likely generates a substantial overall benefit to consumers.[1] Even still, a negative perception of the company strongly permeates modern society and culture. Labor unions protest proposed Wal-Mart entries; competitors publicly vocalize derisive opposition to the store; and local officials have been known to attempt to deter its entry through zoning restrictions. A major reason that Wal-Mart's success has been so controversial is that fact that its rapid entry has pushed traditional retailers, such as the popular and nostalgic Mom-and-Pop stores, out of the market and into bankruptcy. Jia (2006) finds that the entrance of Wal-Mart alone explains 37% to 55% of the net change in the number of small retailers in medium-sized counties from the late 1980's to the late '90's.

Like the Mom-and-Pop stores of the 1970's and '80's, gasoline retailers are now feeling the pressures of Wal-Mart and others. Only a decade ago, virtually all gasoline

[1] Hausman and Leibtag (2005) studied the entry of Wal-Mart Supercenters. Wal-Mart Supercenters sell a vast assortment of groceries as well as the typical retail products associated with the discount retailer.

was sold in a convenience store setting, such as a Chevron station or Shell station. Today, however, non-traditional, high-volume retailers like Wal-Mart have added a new product line – gasoline. These large stores offer low prices and few of the amenities that are typically associated with more traditional gas stations/convenience stores. Common examples of these low pricing, high-volume gasoline retailers, in addition to Wal-Mart, are Costco, Sam's Club, Safeway, and Kroger. Discount, big-box, or grocery stores selling gasoline have been termed in the retail gasoline industry as 'hypermarts' or 'hypermarkets.' Hypermarts tend to locate in more populated areas[2] and attempt to use gasoline sales as a mechanism to generate traffic into their store and subsequently increase store revenue.

As happened with Mom-and-Pop stores decades ago when Wal-Mart entered their markets, several gasoline industry players fear that the traditional gasoline retailer can no longer compete. Many retail gasoline station owners claim that their margins are being squeezed due to the low gasoline prices offered by hypermarts. These claims have led to widespread trepidation amongst station owners that the future of their business is in jeopardy. A small minority of industry players are even concerned that there will be a radical reshaping of the industry; one in which hypermarts command the majority of the market share and traditional retailers are left with a relatively small number of consumers who demand the convenience and setting of the gas station as we now know it.

The intent of this paper is to complement the expanding literature on big-box stores, such as Wal-Mart,[3] by quantifying the price impact of these discount stores on

[2] Hypermarts rarely tend to locate in extremely densely populated areas, such as downtowns of major cities, however. Rents on large pieces of land in these areas are too expensive.
[3] Stone (1995) was the first to examine the impact of Wal-Mart on traditional retailers. He has been followed by Basker (2005a); Basker (2005b); Holmes (2005); Neumark, Zhang, and Ciccarella (2005); and Zhu and Singh (2007); in addition to the papers noted above.

smaller competitors. I have the advantage of measuring the price impact of stores like Wal-Mart on gasoline retailer who sell a relatively homogeneous good in very localized markets. This paper is the first academic research investigating the effects that these hypermarts have on traditional gasoline retailers.

I first develop a discrete-choice, random utility model of consumer behavior to motivate the incentives for big-box and grocery stores to enter the retail gasoline market. The hypermart has an intrinsic spillover in its profit function between gasoline sales and in-store sales. If the spillover is sufficiently large, it is optimal for the hypermart to price its gas lower than the gas station. This is the case because when lowering its price of gasoline, it not only increases its market share of gasoline sales, it also increases its market share of in-store sales. In essence, by lowering its price of gas, the hypermart trades-off profits at the gas station for more profits elsewhere in the store. Traditional gasoline retailers do not have this same spillover and thus are at a competitive disadvantage.[4]

The paper then uses two unique, comprehensive datasets from two geographically diverse cities: Tucson, AZ and Nashville, TN. In both cities I examine the cross-sectional impact of hypermarts on competitors' prices. I find that hypermarts do in fact place statistically significant and economically significant downward pressure on the prices of nearby gas stations. The results show that if a gas station is located within 2 miles of a hypermart its price is depressed by about 1.5 cents, all else equal. From industry data on firm profitability, I conclude a price impact of this magnitude would cut a gas station's profit in half. Moreover, if a station is located within 2 miles of

[4] Most gas stations do have convenience stores attached. However, the spillover between a gas station and its convenience store is drastically less than for a hypermart's gas station and its in-store sales. According to FRMC, Inc., gasoline sales account for about 70% of a traditional gasoline retailer's total sales. On the other hand, gas accounts for less than 5-10% of total sales for hypermarts.

two hypermarts, the effect is doubled. The result is consistent across the two cities and much larger than the effect a traditional retailer has on its competitors. I also examine station prices in Nashville before and after The Home Depot entered the retail gasoline market there by opening two new gas stations as a corporate experiment. Here, results are mixed as prices are depressed in one local market in consistence with the cross-sectional findings, but increased in the other. Overall, given the magnitude of the price impact, it appears the fears of some traditional retailers, like Mom-and-Pop stores before, are being realized. The impact of big-box stores, discount stores, and mass-merchandisers on smaller competitors is remarkable.

The rest of the paper is organized as follows. Section 2 develops a model to motivate the incentives hypermarts have to price their gasoline lower than traditional gasoline retailers. Section 3 provides a brief overview of the retail gasoline industry and describes the recent and rapid emergence of hypermarts into the industry. Sections 4 and 5 discuss the data and empirical results from Tucson, AZ and Nashville, TN, respectively. Section 6 reports findings from the entrance of The Home Depot into the retail gasoline market in Nashville. Section 7 puts the findings of the paper into a greater context by emphasizing the economic significance of the price impact. And finally Section 7 concludes with a brief discussion of how the new developments in the retail gasoline industry mirror a larger societal trend of big driving out small.

SECTION 2: The Model

This section develops a simple discrete-choice, random utility model of consumer behavior and firm responses to that behavior. I compare a multi-product firm to a single-product firm. One may ask why or when a multi-product hypermart would have incentive to price one of its goods lower than its single-product competitor. The purpose of the model is to help answer that by demonstrating the endemic spillover between a hypermart's gasoline sales and its in-store sales. It is due to this spillover that it can be profit-maximizing for a hypermart like Wal-Mart to price its gas lower than what is best for a traditional gas station. In a spatially differentiated product market like retail gasoline, this finding would imply that, in equilibrium, nearby gas stations would be forced to respond to the low pricing ability of the hypermart by lowering their prices, making the local market more competitive. Initially I will characterize the first order conditions for profit-maximization when consumers have a limited set of alternatives. I will then expand the model to completely capture the choice set of consumers.

To start, assume there are *N* consumers indexed by *i=1,…,N*. Also assume there are three firms in the market: i) a gas station ii) a supermarket where one can shop for groceries and other items and iii) a hypermart where one can both buy gas *and* shop for groceries and other items. For simplicity, assume each individual has two choices in a given time period. One, they can choose to buy gas at the gas station and shop at the supermarket; or two, they can choose to purchase gas and do their shopping all in one place at the hypermart. Assuming that individuals who buy gas at the hypermart also shop there and vice versa is equivalent to assuming perfect spillovers between gas and shopping for the hypermart. For each *i*, the utilities of the respective choices can be given by:

Choice 1: $u_{igs} = f(q_g, q_s) - P_g q_g - P_s q_s - t_g - t_s + \varepsilon_{igs}$

Choice 2: $u_{ihh} = f(q_g, q_s) - P_{gh} q_g - P_{sh} q_s - t_h + \varepsilon_{ihh}$

where u_{igs} is the utility individual *i* receives from buying gas at the gas station and shopping at the supermarket, u_{ihh} is the utility individual *i* receives from buying gas at the hypermart and shopping at the hypermart,[5] *f(.)* is some function that characterizes the benefit received from buying gas and shopping, q_g is the average quantity of gas purchased by an individual, q_s is the average quantity of shopping by an individual, P_g is the price of gas at the gas station, P_s is the price of shopping at the supermarket, P_{gh} is the price of gas at the hypermart, P_{sh} is the price of shopping at the hypermart, t_g is the transportation cost associated with getting to the gas station, t_s is the transportation cost associated with getting to the supermarket, t_h is the transportation cost associated with getting to the hypermart, and ε_i is an consumer differentiation parameter for each of the two choices. Generally one would assume that the transportation cost of getting gas at the gas station *and* shopping at the supermarket is greater than the transportation cost of getting both at the hypermart (i.e. $t_g + t_s > t_h$). Notice, the utility functions are the net benefit of each of the two choices.

Further assume that each individual chooses the option that provides him or her with the highest utility. In other words, *i* chooses choice *j* if the utility form choice *j* is greater than the utility from all other potential choices. If we assume that ε_i has a

[5] The first subscript on *u* indicates the consumer. The second subscript indicates where consumer *i* buys gasoline (*g* for the gas station or *h* for the hypermart), and the third subscript indicates where consumer *i* shops (*s* for the supermarket or *h* for the hypermart).

logistic distribution, McFadden (1974) shows that the market shares for each of the two choices are:

$$MS_{gs}(P_g, P_s, P_{gh}, P_{sh}) = \frac{\exp(v_{gs})}{\exp(v_{gs}) + \exp(v_{hh})}$$

$$MS_{hh}(P_g, P_s, P_{gh}, P_{sh}) = \frac{\exp(v_{hh})}{\exp(v_{gs}) + \exp(v_{hh})}$$

where $v_{gs} = f(q_g, q_s) - P_g q_q - P_s q_s - t_g - t_s$ and $v_{hh} = f(q_g, q_s) - P_{gh} q_q - P_{sh} q_s - t_h$.

It is the case that $MS_{gs} + MS_{hh} = 1$.

These market shares are of interest because one can do comparative statics on them and see how they change when P_{gh} changes. First, note that the

$$\frac{\partial MS_{gs}}{\partial P_{gh}} = MS_{gs} MS_{hh} q_g > 0.$$

This says that less people buy gas at the gas station and shop at the supermarket when the hypermart lowers its price of gas. Second, notice the

$$\frac{\partial MS_{hh}}{\partial P_{gh}} = (MS_{hh} - 1) MS_{hh} q_g \leq 0 \quad \text{as } MS_{hh} \leq 1.$$

This suggests that as the hypermart lowers P_{gh} the market share of the hypermart increases. Intrinsically, the structure of the market shares creates a spillover between buying gas and shopping at the hypermart. Decreasing the price of gasoline the hypermart charges not only increases its share of gasoline, but also its share of shopping.

But what P_{gh} should the hypermart set? Is it optimal to set P_{gh} lower or higher than P_g, the price of gas the gas station sets? One can see the answer to these questions by analyzing the gas station's and the hypermart's respective profit functions. It will be helpful to first determine the optimal price of gas for the gas station and then compare that to the optimal price of gas for the hypermart.

Define Q_g as the total quantity of gasoline purchased by consumers. Then the quantity of gas that the gas station sells is equal to $Q_g MS_{gs}$. The gas station thus chooses P_g to maximize

$$\pi_{gas} = (P_g - c_g)Q_g MS_{gs}(P_g, P_s, P_{gh}, P_{sh}),$$

where c_g is the constant marginal cost of gasoline for the gas station. The first order condition for profit maximization for the gas station is:

$$(1) \qquad \frac{\partial \pi_{gas}}{\partial P_g} = MS_{gs}[1 + q_g(P_g - c_g)(MS_{gs} - 1)] = 0 .$$

Equation (1), which is an implicit function of P_g, gives the optimal price of gas, P_g^*, the gas station should set.

The hypermart's profit function is slightly different than the gas station because the hypermart sells both gasoline and shopping. The hypermart chooses P_{gh} and P_{sh} to maximize

$$\pi_{hyper} = (P_{gh} - c_{gh})Q_g MS_{hh}(P_g, P_s, P_{gh}, P_{sh}) + (P_{sh} - c_{sh})Q_s MS_{hh}(P_g, P_s, P_{gh}, P_{sh})$$

where c_{gh} and c_{sh} are the constant marginal costs of gasoline and shopping for the hypermart, respectively, and Q_s is the total quantity of shopping consumed by consumers in the market. The first order conditions for profit maximization for the hypermart are:

$$(2) \qquad \frac{\partial \pi_{hyper}}{\partial P_{gh}} = MS_{hh}[1 + q_g(P_{gh} - c_{gh})(MS_{hh} - 1) + (P_{sh} - c_{sh})(MS_{hh} - 1)] = 0$$

(3) $$\frac{\partial \pi_{hyper}}{\partial P_{sh}} = MS_{hh}[1 + q_s(P_{sh} - c_{sh})(MS_{hh} - 1) + (P_{gh} - c_{gh})(MS_{hh} - 1)] = 0 .$$

Solving equations (2) and (3) simultaneously would give the optimal prices of gas, P_{gh}^*, and shopping, P_{sh}^*, for the hypermart.

Interestingly, we can compare equations (1) and (2) directly to see how P_g^* compares to P_{gh}^*. Assume for a moment that the gas station and the hypermart have equivalent cost functions, so that $c_g = c_{gh}$, and equivalent market shares, so that $MS_{gs} = MS_{hh}$. Suppose the hypermart set its price of gas, P_{gh}, at the price of gas that maximizes the gas station's profit (i.e. at P_g^*). Then from equation (2), the

(4) $$\left.\frac{\partial \pi_{hyper}}{\partial P_{gh}}\right|_{P_g^*} = MS_{hh}(P_{sh} - c_{sh})(MS_{hh} - 1) < 0 .$$

In other words, evaluating equation (2) at the optimal price of gas for the gas station is not profit-maximizing for the hypermart. In fact, the derivative is less than zero implying that the hypermart can increase profit by decreasing its price below P_g^*.

In this simplistic model, where consumers choose between either shopping and buying gas at the hypermart or shopping and buying gas not at the hypermart, it can be shown that the hypermart should always set its price of gas lower than the price of gas the gas station sets. Intuitively, this is the case because by lowering its price of gas, the hypermart can increase the number of people that shop inside the hypermart, thus tradingoff profits at the pump for profits in the store. The gas station does not have this same spillover and consequently cannot match the low price of the hypermart.

A more complete model would allow nine choices for each consumer. These choices are displayed in Table 1. For example, a consumer could choose to buy gas at a gas station and not shop anywhere (Choice 1). Perhaps this consumer eats out exclusively during the time period. Or for instance, a consumer could perhaps not purchase gas at either a gas station or a hypermart but the consumer chooses to shop at the supermarket (Choice 2). Choice 9 in the table is the outside alternative of purchasing neither gas nor shopping. In reality, most individuals purchase gas and shop regularly so we'd expect the market shares on choices 1, 2, 5, 7, and 9 to be small if not zero.

Table 1

Consumer Choices		
Choice	**Buy Gas**	**Shop**
1	Gas Station	--
2	--	Supermarket
3	Gas Station	Supermarket
4	Hypermart	Supermarket
5	Hypermart	--
6	Hypermart	Hypermart
7	--	Hypermart
8	Gas Station	Hypermart
9	--	--

In this framework, consumers generate utility from the nine alternatives. The utilities for each *i* are:

Choice 1: $u_{ig0} = f(q_g, 0) - P_g q_g - t_g + \varepsilon_{ig0}$

Choice 2: $u_{i0s} = f(0, q_s) - P_s q_s - t_s + \varepsilon_{i0s}$

Choice 3: $u_{igs} = f(q_g, q_s) - P_g q_g - P_s q_s - t_g - t_s + \varepsilon_{igs}$

Choice 4: $u_{ihs} = f(q_g, q_s) - P_{gh} q_g - P_s q_s - t_h - t_s + \varepsilon_{ihs}$

Choice 5: $u_{ih0} = f(q_g, 0) - P_{gh} q_g - t_h + \varepsilon_{ih0}$

Choice 6: $u_{ihh} = f(q_g, q_s) - P_{gh} q_g - P_{sh} q_s - t_h + \varepsilon_{ihh}$

Choice 7: $u_{i0h} = f(0, q_s) - P_{sh} q_s - t_h + \varepsilon_{i0h}$
Choice 8: $u_{igh} = f(q_g, q_s) - P_g q_g - P_{sh} q_s - t_g - t_h + \varepsilon_{igh}$
Choice 9: $u_{i00} = 0 + \varepsilon_{i00}$

As before, the first subscript on *u* indicates the consumer; the second subscript indicates where the consumer purchases gasoline (*g* for the gas station, *h* for the hypermart, or *0* for nowhere); and the third subscript indicates where the consumer shops (*s* for the supermarket, *h* for the hypermart, or *0* for nowhere). Utility on the outside alternative is normalized to zero with an idiosyncratic disturbance term.

As above each individual chooses the option that provides him or her with the highest utility. In other words, *i* chooses choice *j* if the utility from choice *j* is greater than the utility from any of the other eight choices. Assuming ε_i has a logistic distribution, the market share for the j^{th} choice is:

$$MS_j(P_g, P_s, P_{gh}, P_{sh}) = \frac{\exp(v_j)}{\sum_{l=1}^{9} \exp(v_l)},$$

where *v* is the non-stochastic part of the utility function for the j^{th} choice.

In this context the gas station's profit equation will be a function of three shares of consumers: people who buy gas at the gas station only, people who buy gas at the gas station and shop the supermarket, and people who buy gas at the gas station and shop at the hypermart. Hence,

$$\pi_{gas} = (P_g - c_g) Q_g (MS_{g0} + MS_{gs} + MS_{gh}).$$

The gas station chooses P_g to maximize its profit. The first order condition for profit maximization is:

(5) $$\frac{\partial \pi_{gas}}{\partial P_g} = (MS_{g0} + MS_{gs} + MS_{gh})(1 + (P_g - c_g)q_g[(MS_{g0} + MS_{gs} + MS_{gh}) - 1]) = 0$$

Similarly the hypermart maximizes its profit equation, which is a function of the people who purchase gasoline at the hypermarket and the people who shop there.

$$\pi_{hyper} = (P_{gh} - c_{gh})Q_g(MS_{h0} + MS_{hs} + MS_{hh}) + (P_{sh} - c_{sh})Q_s(MS_{0h} + MS_{gh} + MS_{hh})$$

As opposed to the simpler example where consumers had only two choices, notice here the share of people who purchase gas at the hypermart does not have to and likely will not equal the share of people who shop at the hypermart. The hypermart's first order condition with respect to P_{gh} is:

(6) $$\frac{\partial \pi_{hyper}}{\partial P_{gh}} = (MS_{h0} + MS_{hs} + MS_{hh})(1 + (P_{gh} - c_{gh})q_g[(MS_{h0} + MS_{hs} + MS_{hh}) - 1]) + (P_{sh} - c_{sh})q_g[(MS_{0h} + MS_{gh} + MS_{hh})(MS_{h0} + MS_{hs} + MS_{hh}) - MS_{hh}] = 0.$$

Here, if we assume the gas station is identical to the hypermart (meaning equal gasoline market shares and costs), the

(7) $$\left.\frac{\partial \pi_{hyper}}{\partial P_{gh}}\right|_{P_g^*} = (P_{sh} - c_{sh})q_g[(MS_{0h} + MS_{gh} + MS_{hh})(MS_{h0} + MS_{hs} + MS_{hh}) - MS_{hh}]$$

In equation (4) in the simpler model this derivate evaluated at P_g^* was always negative, meaning the hypermart would always price lower than the gas station. Here, the sign of the derivative is indefinite. The sign, however, will depend on the sign of the terms in the brackets. Technically speaking the terms in the brackets would be negative if the percent of people that buy gas at the hypermart times the percent of people that shop at the hypermart is less than the percent of people that buy both gas and shop at the hypermart (the spillover term). If we had perfect spillovers as in the simpler model all the other market shares besides MS_{hh} would be zero and the brackets would be negative. An implication is that if the percent of people that buy one but not both products at the hypermart is sufficiently small compared to the percent of people that buy both products there, then the terms in the brackets will be negative and it will be profit-maximizing for the hypermart to price its gas lower than what is optimal for the gas station. On the other hand, if the spillover is weak (i.e. not many people who buy gasoline at the hypermart also shop at the hypermart), then the hypermart would not have profit incentives to price its gas low. Overall, the ability of the hypermart to profitably price low is intrinsically tied to the relative size of the spillover between gasoline sales and in-store sales. Again, gas stations do not have this same spillover and consequently are not able to profitably match the low prices of the hypermarts. As Section 3 will explain in more detail, it is due to this competitive difference, coupled with the increasing presence of hypermarts in the industry, that many traditional gasoline retailers are so fearful of the future viability of their stations as Mom-and-Pop stores were in the past.

SECTION 3: Industry Overview

The goal of this section is to provide a basic background covering the recent increase in hypermart presence across the US. The effort here is to illuminate the model in Section 2 by i) providing quantitative evidence suggesting hypermarts have a substantial and increasing presence in the retail gasoline industry and ii) providing quantitative and additional qualitative evidence why hypermarts are willing to sell gas at lower prices than traditional gas stations. The following statistics demonstrate that hypermarts will have a substantial long-run impact within the retail gasoline industry.

Table 2 shows the retail gasoline industry has been experiencing contraction. In 2000, there were nearly 176,000 outlets selling gasoline in the US. This number has fallen nearly 5% to approximately 167,500 outlets in 2006. It is during this time of reduction, though, that hypermarts have experienced expansion. Hypermarts' growth has been recent and rapid. In the year 2000, there were 1,140 hypermarts in the US. In 2002, the number grew to 2,434, a 113% increase. In 2006, the number had risen to over 4,000 locations, a total increase of over 250% from 2000. The general trend of industry contraction combined with rapid hypermart entry suggests traditional retailers have had a particularly difficult start to the new millennium. Traditional retailers experienced a decrease of almost 11,500 stations at the same time hypermarts were growing.

Table 2

US Gasoline Retailers Declining, Hypermarts Increasing			
	Total # of Gasoline Retailers	# of Traditional Retailers	# of Hypermarts
2000	175,941	174,801	1,140
2002	170,016	167,582	2,434
2005	168,987	165,469	3,518
2006	167,476	163,423	4,053

Source: Total Number of Gasoline Retailers: *National Petroleum News*[6]
Number of Hypermarts: *EAI, Inc.*

Each hypermart location is consequential in terms of the volume of gasoline it sells. In 2006, the typical hypermart location sold over 250 thousand gallons per month.[7] This volume is in stark contrast to traditional retailers who, as estimated by the National Association of Convenience Stores (NACS), sold only 110 thousand gallons per month on average in that same year. Table 3 breaks out the number of hypermarts by type (e.g.

[6] Estimating the number of gasoline retailers is a little tricky. The National Petroleum News estimate includes all outlets that sold gas to the public. This includes very low-volume retailers such as marinas. According to the National Association of Convenience Stores (NACS) there were approximately 112,000 convenience stores selling gasoline in 2006. A convenience store is more what one typically thinks of when they think of a gas station. However, there are many 'traditional' gas stations that do not have convenience stores and thus would not be included in NACS' count.

[7] Estimate according to EAI, Inc.

grocery store, discount store, or mass-merchandiser/club store) and compares these stores to convenience stores in terms of volume for 2006. The table shows that most hypermarts are grocery stores, such as Kroger and Safeway. The biggest hypermarts, though, in terms of average volume sold per station per month are the mass-merchandisers or club stores like Costco and Sam's Club. Of note, Wal-Mart was responsible for over 1,300 of the hypermarts in 2006 contributing to all three hypermart store types between its Wal-Mart stores, Neighborhood Markets, and Sam's Clubs. Given that an average hypermart location sells two to three times the quantity of gasoline that a gas station does, hypermarts compose a meaningful percentage of the retail gasoline industry market share even though they are few in number.

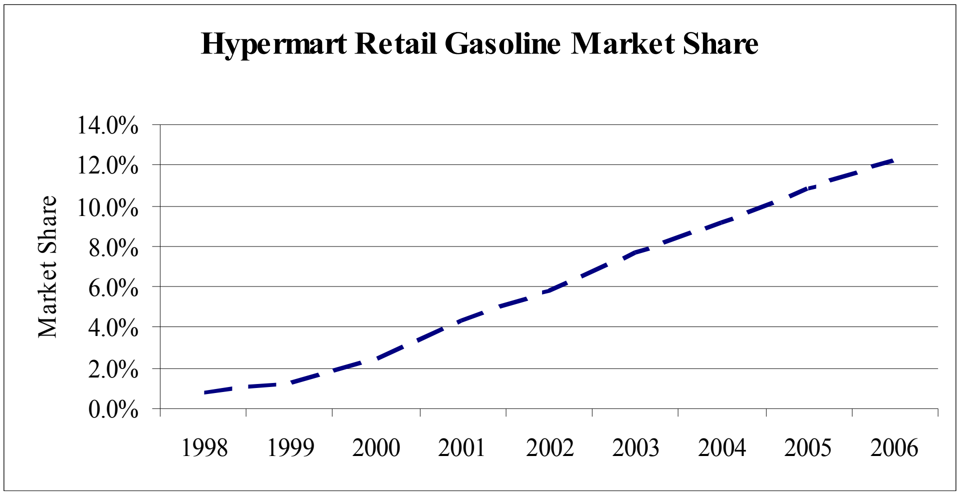
Table 3

Hypermarts by Store Type: 2006		
Store Type	**Number**	**Mean Gallons Sold/ Store/Month (000's)**
Grocery Stores	2,164	197,000
Discount Stores	1,045	238,000
Mass-Merchandisers/Clubs	844	430,000
All Hypermarts	4,053	253,000
Convenience Stores	112,000	108,000

Source: Hypermarts: *EAI, Inc.*
Convenience Stores: *NACS*

Figure 1 illustrates the increasing market power of hypermarts over time. In 1998, hypermarts were virtually non-existent, accounting for less than 1% of the industry market share. By 2002 hypermart market share had risen to 5.8% and continued rising to 12.2% in 2006 in an almost linear fashion. Hypermart market share has increased an average of 1.4 percentage points per year with the largest increase from 2002 to 2003 when it rose by 1.9 percentage points.

Figure 1



Source: *The NPD Group/Motor Fuels Index*

As the model in Section 2 suggests can be the case, hypermarts do price lower than traditional gas stations. Industry studies by EAI, Inc. have found that hypermarts sell gas at prices that are three to ten cents less per gallon.[8] This ability to price low is an important benefit because consumers are shown to be sensitive to price differentials across stations. A consumer survey conducted by NACS in 2007 indicated that 47% of consumers said they would be willing to make a left-hand turn across a busy street to save 3 cents per gallon; 35% said they would drive five minutes out of their way to save the same amount; 25% said they would drive ten minutes to save 3 cents; and an astonishing 11% said they would drive ten minutes out of their way to save only one penny per gallon.[9] Accordingly, when hypermarts price only a few cents lower then their competition, they are able to attract a meaningful percentage of new customers.

An important thrust of this paper is the assertion that hypermarts are less interested in profiting directly from gasoline sales than is a traditional gas station. If direct gasoline profits are not the incentive for selling gasoline, then what is? The

[8] I provide similar evidence for the Tucson and Nashville markets later in the paper.
[9] See NACS 2007 Consumer Fuels Report. NACS followed up the survey to see if people were actually as price sensitive as they claimed. NACS concluded that people were less sensitive. The survey data suggest at least that people perceive themselves to be extremely sensitive to differentials in gasoline prices.

contention made here, as suggested in the model, is that hypermarts can increase in-store traffic and entire store profits[10] by selling gas at lower prices than their competitors.

Joseph Leto, a respected industry leader and president of Energy Analysts International (EAI), spoke of these spillover incentives in *Supermarket News* saying that grocery stores can increase in-store sales by as much as 20% by selling gasoline outside their store. Certainly a 20% increase in in-store sales is an upper bound that most grocery stores cannot expect to achieve; but nonetheless, these comments provide evidence that selling gas outside of one's store can have substantial impacts on in-store sales.

As further motivation for big-box stores, grocery stores, and mass-merchandisers to cross over into the gasoline industry, an EAI report prepared for the California Energy Commission suggests that selling gasoline can increase trip frequency and cross traffic to one's store. For example, before selling gas, a typical family may have frequented a hypermart only once every two weeks. After selling gas, that same family may frequent the same store once a week. On top of an increase in trip frequency, EAI's findings assert gasoline is able to draw more traffic to stores than offering traditional discounts on individual supermarket items. Therefore, offering gasoline as another product not only increases the number of trips an existing customer makes, but it also increases the number of new customers that visit the store.[11]

As final motivation, and perhaps an often overlooked fact, selling gasoline allows hypermarts to maximize the value of underutilized land. Real estate expenses are a large fixed cost incurred by a store and generally the majority of a store's land is allocated to

[10] Entire store profits are defined as the sum of profits from in-store sales and gasoline sales.
[11] See *EAI, Inc.*, U.S. Hypermart Petroleum Market Outlook: Emergence Of The New Competitive Arena, July 11, 2003.

parking. Being able to convert a few dozen parking spaces that are rarely used into a rent generating activity is an appealing option for a store.

Given the reality of nationally increasing hypermart market share, much angst has been building among gas station owners. Gas station owners contend that they are already operating on extremely small margins and any additional market pressures will force some stations out of business. Table 4 details the average gas station's profitability for 2001-2006.[12] In recent years, gas stations have made only about 1% of sales in pretax profit and about $30,000 in pretax profit per station per year.[13] Given both the small profit margins and dollars earned in the industry, significant downward pressure on gas station prices as a result of hypermart presence could noticeably alter the retail gasoline industry make-up in a similar way the entrance of Wal-Mart altered the discount retailing industry in the 1980's and '90's. The threat of shake-up in the industry has led to considerable trepidation among gas station owners and other industry players as they plan the future course of their businesses in a more competitive environment.

Table 4

Mean Gas Station Profitability		
	Pretax Profit Margin (percent of total sales)	**Pretax Profit per Station**
2001	1.00%	$24,240
2002	1.12	28,500
2003	1.05	29,928
2004	0.91	29,280
2005	1.29	54,996
2006	0.76	34,944

Source: *FRMC, Inc.*

[12] Data were provided by FRMC, Inc. FRMC is an independent consulting firm to retail gasoline stations. FRMC computes industry benchmarks for various financial ratios.

[13] The abnormally large profit margin and pretax profit dollars in 2005 were primarily a result of supply disruptions and unusual market conditions driven by hurricanes Katrina and Rita in the latter part of the year.

Section 4: Tucson Market

The next aim of this paper is to analyze the effect of hypermart entry on traditional gas station prices. The findings here will be of significant interest to industry players as well as provide further insights into both the nature of competition within the retail gasoline industry and the impact big-box stores like Wal-Mart have on smaller competition. An ideal experiment to estimate the impact of big-box, grocery, and discount stores on retail gasoline competitors would be to collect data on prices for every gas station in the US and then see how proximity to hypermarts affects price. Of course this is an infeasible task. Therefore, I followed in the footsteps of others in the literature (e.g. Barron, Taylor, and Umbeck (2000) and (2004), Shepard (2003), Johnson and Romeo (2000)) and collected gasoline data for a city. I actually collected data from two regionally diverse cities: Tucson, AZ and Nashville, TN. I will address the results from Nashville in Section V.

Data

The greater Tucson area has a population of just over 900,000 residents with a geographical area covering 600 square miles and 29 zip codes.[14] A comprehensive dataset of prices, characteristics, and locations were collected for every gas station in the city of Tucson.[15] In 2005, there were 227 gas stations and eight hypermarts for a total of 235 observations.

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[14] These estimates were obtained from the US Census Bureau.

[15] Station prices and characteristics were recorded within a 14 hour period on March 12, 2005. It was important to gather prices on the same day to account for fluctuations in input prices. If station prices were gathered over time, it is likely to be the case that station A's price differs from station B's price simply because they have different marginal costs. It is reasonable to assume that marginal costs are the same for all stations in a particular city on a given day. It would not, however, be reasonable to assume that marginal costs are the same for all stations on a given day when the stations are located in different geographical regions. If the latter is the case, then the researcher would have to control for the regional differentials in marginal cost. Moreover, taxes would also have to be taken into consideration as they differ across cities and states as well.

I have asserted that hypermarts price lower than traditional gas stations in order to attract more customers into their store. Table 5 breaks-out average prices for hypermarts and gas stations in Tucson. The average price for regular gasoline at a hypermart is $1.97. The average price for regular gasoline at a traditional gasoline retailer is $2.01. These statistics are consistent with the EAI study that found most hypermarts price anywhere from three to ten cents below traditional gas stations. Table 5 also differentiates between branded gas stations and unbranded gas stations. There are 111 branded gas stations with an average price of regular gas of $2.03 and there are 116 non-branded stations with an average price of $1.99. These statistics show that hypermarts tend to price the lowest, followed by non-branded stations and then by branded stations.[16]

Table 5

Mean Price of Regular Gasoline: Tucson, AZ					
	Mean	**s.e.**	**95% C.I.**		**Obs**
Hypermarts	$1.973	$0.007	$1.957	$1.988	8
All Gas Stations	2.011	0.003	2.005	2.016	227
Branded	2.029	0.005	2.020	2.038	111
Non-Branded	1.993	0.002	1.988	1.998	116

Table 6 breaks-out station prices by its respective brand. After viewing the table it is clear that some brands price higher than others. The table arranges the brands from the lowest average price on regular fuel to the highest. Arco prices the lowest of all the brands at $1.97. Interestingly, Arco and Diamond Shamrock price slightly lower (a few hundredths of a cent) than the hypermarts according to their unconditional means.[17] On

[16] Branded stations are defined as gas stations associated with a major oil company's brand. Examples would be Shell stations or Exxon stations. Non-branded or unbranded stations are stations unassociated with a major oil company. Many non-branded stations operate dozens to hundreds of stations across the country, while others operate just one. Generally companies operating several non-branded stations are referred to as 'private-branded.' Examples of large private-brands are Sheetz, Wawa, The Pantry, and Quik Trip.

[17] It should be stated that Arco is a unique brand. Its corporate office has made it an explicit objective to have the lowest price. The major reason they are able to achieve this objective is that the majority of their stations do not allow the use of credit cards at their pumps. Of the eleven Arco stations in the Tucson

the other end of Table 6, we see that Chevron is perceived as a premium brand in the Tucson market with an average price of $2.07 per gallon. The Other category includes all the non-branded stations except Circle K. I listed Circle K as itself because it represents over one-third of all gas stations in Tucson. The non-branded stations generally price higher than the hypermarts but lower than most of the major oil company brands.

Table 6

Mean Prices of Regular Gasoline by Brand: Tucson, AZ					
Brand	**Mean**	**s.e.**	**95% C.I.**		**Obs**
Arco	$1.969	$0.003	$1.961	$1.977	11
Diamond Shamrock	1.971	0.001	1.968	1.975	14
Hypermarts	1.973	0.007	1.957	1.988	8
Conoco	1.983	0.008	1.964	2.001	11
Other	1.993	0.005	1.982	2.004	33
Circle K	1.993	0.003	1.988	1.999	83
Citgo	2.030	0.000	2.030	2.030	6
76	2.030	0.012	2.001	2.058	7
Exxon	2.043	0.010	2.021	2.067	8
Mobil	2.043	0.003	2.036	2.051	13
Shell	2.060	0.010	2.040	2.084	10
Texaco	2.060	0.009	2.035	2.085	5
Chevron	2.074	0.010	2.054	2.094	26
All Stations	2.009	0.003	2.004	2.016	235

On the whole, gasoline is a relatively homogeneous good. Price differentials exist across stations in part due to differences in perceived quality and brand loyalty. Another main reason price differentials are observed is that gasoline stations are spatially differentiated. A spatially differentiated products model suggests a competitor is forced to respond to the presence of competition, such as a hypermart, by reducing its price. A testable implication is that a station's price should be lower when there are more competing gas stations around it. Thus, to capture the price pressure placed on a station

dataset, only one permits the use of credit cards.

by a hypermart, it is important to control for the presence of other traditional retailers in order to disentangle the two confounding effects.

A common way in the literature to capture the effect of competition from nearby gas stations is to count the number of gas stations within a pre-specified Euclidean radius of a particular station (see Barron, Taylor, and Umbeck (2000), (2004)). I argue that this may not be the best measure. For one, using a Euclidean radius measure doesn't take waterways, freeways, or other impediments into account. For example, one gas station may be located on one side of a river and another gas station may be located on the other side of a river. If the nearest crossing of the river is two miles away, it is unreasonable to assume that the two stations are heavily competing even though they are reasonably close in a line-of-sight direction. As a result, I use road distance[18] as a more appropriate measure.[19] Proximity to other gas station competition is defined as the number of gas stations within a pre-specified driving distance of particular station. For estimation, I separately counted the number of stations within one-half of a road mile, the number between one-half and one-and-a-half road miles, and the number between one-and-a-half and two-and-a-half road miles.

Next, I counted the number of hypermarts within one-half of a road mile, the number between one-half and one-and-a-half road miles, the number between one-and-a-half and two-and-a-half road miles, and the number between two-and-a-half and three-and-a-half road miles, of a particular gas station and used these as a measure of proximity to hypermarts. These are the key variables of interest. I use a larger range (up to three-and-a-half road miles as compared to up to two-and-a-half miles) when calculating

[18] Hastings (2004) also used road distances.
[19] I was able to collect the specific location of each station. I then used the mapping function on *mapquest* to calculate the distance from each station to every other.

proximity to hypermarts than when calculating proximity to other gas stations. The reason for this is two-fold. First, it was reported earlier that the average hypermart sells over two times the volume of gasoline as does a traditional store. Hence, a hypermart is attracting a larger customer base. Second, the key business strategy of a hypermart is the bundling of a large retail store and gasoline. People who frequent hypermarts often are there not just to buy gas, but also to go to the store. Hypermarts provide customers with the ability to economize on trips. It is reasonable that a typical person is willing to drive a farther distance to a supermarket or mass-merchandiser than to a gas station. When faced with the option of getting gas at a cheaper price and at the same time being able to get some shopping done, I argue that a typical consumer is going to be more willing to drive the extra distance.

Table 7 lists the summary statistics of the competition measures listed above and of the other control variables. I would expect to observe the greatest price pressure when two stations are located very close to one another. On average, there are 0.68 gas stations within one-half road mile of a particular gas station. The most a station ever has is four gas stations within one-half road miles while other stations have zero competitors within that distance. As we expand the distance band, more competitors are present because each band has a greater area. The average distance to the nearest gas station is 0.57 road miles. Turning to hypermarts, there are on average 0.03 hypermarts within one-half road miles of a given retail location and the average distance to the nearest hypermart is 4.68 road miles. These statistics show that the majority of gas stations in Tucson are not close to hypermarts.

Table 7

Summary Statistics of Control Variables: # of Obs. = 235				
Variable	**Mean**	**s.e.**	**Min**	**Max**
# Gas Stations < 0.5 mile	0.68	0.050	0	4
# Gas Stations 0.5 - 1.5 miles	3.61	0.159	0	11
# Gas Stations 1.5 - 2.5 miles	7.63	0.266	0	17
# Hypermarts < 0.5 mile	0.03	0.011	0	1
# Hypermarts 0.5 - 1.5 miles	0.14	0.025	0	2
# Hypermarts 1.5 - 2.5 miles	0.32	0.039	0	3
# Hypermarts 2.5 - 3.5 miles	0.39	0.040	0	3
Convenience Store	0.89	0.021	0	1
Franchise Food	0.08	0.017	0	1
Car Wash	0.06	0.016	0	1
Repair Shop	0.08	0.018	0	1
# of Pumps	8.26	0.237	2	20
Median Income (thousands of dollars)	35.67	0.805	19.34	78.03
Population Density (thousands of people)	2.61	0.016	0.02	5.38
Traffic Flow (thousands of cars per day)	46.52	1.594	3.1	107.25

Despite collecting data on locations, nearby competition, and specific brands of stations, I also collected other station characteristics. Dummy variables were constructed if a store had a convenience store, a franchise food establishment,[20] a car wash, or a repair shop. The summary statistics for these variables can also be seen in Table 7. Of the 235 gasoline outlets in Tucson, 209 had a convenience store, 18 had a franchise food establishment, 14 had car washes, and 19 had repair shops. The mean number of pumps at each station was just over eight.

Relevant demand side variables were also calculated using data from the US Census Bureau at the zip code level. Specifically, median income and population density were taken from the census. The assumption is that wealthier zip codes should have higher gas prices and more densely populated zip codes should have higher prices.[21]

[20] Franchise food establishments are gas stations where the station is physically combined with a franchise store. Common examples of franchise food establishments are Subway, McDonald's, and Dominos Pizza. Gas stations and franchise foods combine together to take advantage of economies of agglomeration.

[21] Measuring demand based on zip code characteristics has some drawbacks. Take median income for example. Suppose a gas station is located near the boundary of a particular zip code. It is likely the case that the neighboring zip code's median income differs meaningfully from the zip code that the gas station is

One other demand side variable was constructed in an attempt to capture the amount of driving that is taking place around a station. I calculated the average 24-hour traffic volume[22] of automobiles on the street that each station is located.[23] This variable improves upon using a dummy variable if the station is located on a "major" street as seen used in the literature.[24] Furthermore, this variable allows each station to have its own unique traffic volume. One would expect that a station located on a street with more traffic flow is more able to sustain higher prices than a station located on a street with low traffic volumes, all else equal.

Estimation

With the data I have collected, I estimate the following equation:

$$p_i = \alpha + K_i\beta + C_i\delta + D_i\gamma + B_i\lambda + \varepsilon_i,$$

where p_i is the price of regular gasoline at each station, K_i is a vector that separately counts the number of gas stations and the number of hypermarts within the respective distance bands of each station,[25] C_i is a vector of each station's characteristics, D_i is a

in. If this is the case, then the zip code measure may not actually represent the true median income of consumers who visit the station. One way to get around this problem is to choose a pre-specified radius around a station and then measure the median income of the population within that radius. This approach has the same drawbacks as mentioned earlier. Often there are rivers, freeways, or other barriers that make it difficult for a consumer to get to a particular gas station even though the consumer resides within the specified radius. Hence, the radius technique is not a perfect measure either. To complicate matters worse, it is quite often the case that a consumer purchases gasoline on the way to or from work or other destinations. If the consumer works a long way from his or her house, then the gas station could be in a very different part of town than where the consumer lives. When this situation applies to a large proportion of the population, neither the zip code measure nor the radius measure will perform well. However, without the luxury of being able to observe the specific characteristics of every individual who frequents a particular gas station, certain simplifications and approximations must be made.

[22] The data was provided by the Pima County Department of Transportation. Tucson is located in Pima County.

[23] If a station was located on a street corner, then the traffic volume for that station is the sum of the traffic volume on the two perpendicular streets.

[24] See Eckert and West (2004), Eckert and West (2005a), and Eckert and West (2005b)

[25] There are seven variables in *K*: the number of gas stations within 0.5 road miles; 0.5-1.5 road miles; 1.5-2.5 road miles; and the number of hypermarts within 0.5 road miles; 0.5-1.5 road miles; 1.5-2.5 road miles; and 2.5-3.5 road miles.

vector of measures of demand, B_i is a vector of dummy variables indicating the brand for each station, and ε_i is a disturbance term[26].

Table 8 displays the results of the regression for Tucson. The first variables listed in the table are the most important. The coefficient on the number of hypermarts located within one-half road mile of a station is -0.021 and is statistically significant at the 1% level. This means that a station's price is 2.1 cents lower for each hypermart that is located within one-half mile of it. The average price for a gas station in Tucson is $2.01. Therefore, adding a hypermart nearby would reduce the average station's price from $2.01 to less than $1.99. As I will discuss later, this effect is not only statistically significant but it is economically significant.

What's more, the price impact of a hypermart is larger than that of a traditional gasoline retailer. The effect of an additional gasoline retailer within one-half mile reduces a given station's price by 0.4 cents with a p-value of 0.06. I conducted a Wald test to see if the difference between a hypermart's impact on a station were different than a traditional retailer's impact. The difference between the coefficients is statistically significant at the 5% level.[27]

[26] The standard errors have been corrected for arbitrary heteroskedasticity.

[27] The Wald test is a test of linear restrictions. The null hypothesis is that the coefficient of the number of gasoline stations equals the coefficient on the number of hypermarts. In this context, the test statistic has an F-distribution. $F(1,208) = 3.82$ with a corresponding p-value of 0.052.

Table 8

Regression of Regular Price of Gasoline: Tucson, AZ				
Variable	**Coefficient**	**Robust s.e.**	**t-stat**	**p-value**
# Gas Stations < 0.5 mile	-0.0039	0.0021	-1.87	0.064
# Gas Stations 0.5 - 1.5 miles	-0.0015	0.0009	-1.78	0.076
# Gas Stations 1.5 - 2.5 miles	0.0007	0.0006	1.04	0.298
# Hypermarts < 0.5 miles	-0.0211	0.0082	-2.58	0.011
# Hypermarts 0.5 - 1.5 miles	-0.0127	0.0063	-2.00	0.047
# Hypermarts 1.5 - 2.5 miles	-0.0044	0.0041	-1.09	0.279
# Hypermarts 2.5 - 3.5 miles	-0.0038	0.0041	-0.92	0.361
Hypermart	-0.0249	0.0105	-2.38	0.018
Arco	-0.0237	0.0068	-3.50	0.001
Chevron	0.0748	0.0053	14.12	0.000
Conoco	-0.0077	0.0107	-0.72	0.474
Citgo	0.0299	0.0060	4.95	0.000
Diamond Shamrock	-0.0201	0.0063	-3.19	0.002
Exxon	0.0479	0.0103	4.66	0.000
Mobil	0.0440	0.0066	6.68	0.000
Shell	0.0642	0.0108	5.93	0.000
76	0.0244	0.0115	2.13	0.035
Texaco	0.0620	0.0093	6.65	0.000
C-store	-0.0046	0.0081	-0.57	0.572
Franchise Food	0.0111	0.0126	0.89	0.377
Car Wash	0.0033	0.0153	0.22	0.827
Repair Shop	0.0160	0.0072	2.22	0.027
ln(# of pumps)	-0.0031	0.0055	-0.56	0.575
Median Income	0.0003	0.0003	1.10	0.272
Population Density	0.0029	0.0015	1.95	0.052
Traffic Flow	0.0002	0.0002	1	0.178
Constant	1.9831	0.0141	141	0.000
# of Observations	235			
F(26,208)	35.64			
R-square	0.6402			
Root MSE	0.0276			

Since the estimation is non-parametric, one can look farther out than 0.5 road miles to see if there is still a significant effect of having a competitor nearby. According to Table 8 adding a hypermart between 0.5 – 1.5 road miles of a gas station reduces that gas station's price by 1.2 cents, all else equal. In contrast, adding a gas station in that distance band only decreases a station's price by 0.2 cents. The coefficients are statistically significantly different at the 7% level.[28] As one adds a competitor, whether a

[28] The Wald test statistic is $F(1,208) = 3.34$, with a corresponding p-value of 0.069.

hypermart or a traditional gas station, at a distance greater than 1.5 miles from a competitor, the impact becomes statistically insignificant.

The hypermart dummy is also statistically significantly different from zero. The regression indicates that a hypermart prices 2.5 cents lower than non-branded stations – the baseline. Even more, the hypermart dummy is smaller than both the Arco dummy and the Diamond Shamrock dummy, although not statistically significantly lower. Earlier we saw that Arco and Diamond Shamrock priced lower than the hypermarts in the unconditional mean. This finding is weak evidence that, after controlling for differences in demand and station characteristics, hypermarts price the lowest of all brands and certainly price lower than most brands in Tucson.[29]

Of additional note in the regression, the regression seems to fit the data reasonably well. The R-square is 0.64. Also, having a repair shop increases a station's price by 1.6 cents and being in a more densely populated area increases its price. Most station characteristics are not statistically different from zero, although the signs are reasonable.

Section 5: Nashville

One might look at the analysis done in Tucson and feel the results might be spurious. One might think that Tucson is just one city; perhaps the finding that hypermarts place significantly more downward pressure on competitors prices is driven by something specific to Tucson, such as abnormally high tastes for hypermart gasoline. Further, one might see that there are only eight hypermarts in Tucson and think the findings are being driven by a small sample of hypermarts. I unequivocally do not see

[29] The coefficient on the hypermart dummy is statistically smaller than the coefficients on all other brand dummies except the Conoco dummy.

the latter claim to be the case. While there are only eight hypermarts, I am analyzing the impact on competing station prices and there are several stations located nearby each of the eight hypermarts. The average hypermart has over 8.5 competitors within two road miles of it. Nevertheless, to help diffuse the two contentions above I conduct the same analysis on a separate, geographically diverse, larger city – Nashville, TN.

Data

Prices, brands, locations, and characteristics were collected for approximately 550 gas stations and hypermarts in the greater Nashville area. The greater Nashville area has a population of about 1.5 million. The data set includes Nashville and the suburbs of Antioch, Arrington, Ashland City, Bellevue, Brentwood, Franklin, Gallatin, Goodlettsville, Hendersonville, Hermitage, Joelton, La Vergne, Lebanon, Madison, Millersville, Mount Juliet, Murfreesboro, Nolensville, Old Hickory, Smyrna, and Whites Creek.[30] In addition, I took censuses of all retail gasoline outlets in Nashville at three separate time periods: November 2005, March 2006, and January 2007.[31]

Table 9 lists the number of stations and characteristics of the stations for the three censuses. The total number of stations in Nashville increased slightly over the period studied. The number of traditional gas stations grew by 1.1%; the number of hypermarts grew by 17%. This trend is consistent with the national trend laid out in Section 3 that hypermarts are increasing in presence relative to traditional retailers throughout the US. Hypermarts account for 5-6% of the total number of stations in Nashville. As Section 3 points out, hypermarts tend to sell around 2.5 times the volume that traditional retailers

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[30] When collecting a data set that spans geographically, the researcher is always faced with the dilemma of stopping and drawing a line somewhere. I purposefully collected stations until population became sparse and there was no nearby competition outside my sample boundary. Generally the nearest station outside my sample boundary was over 5 miles away. This was in an effort to minimize any biases for stations on the boundary of the data set. The same was true in Tucson.

[31] Prices and characteristics were collected within a 36-hour period for all three censuses.

do. If this is true in Nashville, then hypermarts account for approximately 14-15% of the market share in Nashville, again consistent with the national estimates in Section 3.

Table 9

Market Characteristics: Nashville, TN			
	Census 1 Nov. 2005	**Census 2 Mar. 2006**	**Census 3 Jan. 2007**
Gas Stations	518	526	524
Hypermarts	29	31	34
Total Stations	547	557	558
Convenience Stores	477	487	485
Franchise Food	36	39	39
Car Wash	95	98	96
Repair Shop	36	36	35
Pay at Pump	482	492	496
Avg. # of Pumps	7.93	7.98	8.02

Table 9 also shows that roughly 87% of stations have convenience stores and 88% allow the consumer to pay at the pump as opposed to paying only inside a convenience store or at a kiosk. About 17% of stations have car washes and 7% have repair shops or franchise food establishments. The average station has approximately 8 pumps. Hypermarts tend to have more pumps (9.6 on average) than traditional gas stations (7.9), however, gas stations can be quite large and have many pumps. One gas station in the data set has 24 pumps, while the largest hypermart has only 14 pumps.

Table 10 provides summary statistics for the prices of hypermarts and traditional retailers; they are similar to Tucson. Hypermarts price on average, not controlling for other factors, about seven cents lower than traditional gas stations in Nashville. The result is consistent across the three censuses. These differences in raw averages are statistically significant at any reasonable level of significance.[32] It should be noted that the overall level of prices increased from census 1 to census 2. The overall level of prices

[32] All three censuses have p-values less than 0.000 using a two-tailed difference-in-means test with unequal variances.

fell, though, from census 2 to census 3 with census 3 having the lowest prices overall. These large changes in the overall level of prices for the area are explained predominately by differences in wholesale prices across time, and only marginally, if at all, by differences in the competitive environment in Nashville across time.

Table 10

Mean Price of Regular Gasoline: Nashville, TN			
	Census 1	**Census 2**	**Census 3**
Gas Stations	$2.27 (-0.004)	$2.50 (-0.002)	$2.14 (-0.003)
Hypermarts	2.199 (-0.16)	2.43 (-0.009)	2.072 (-0.012)
All Stations	2.262 (-0.004)	2.498 (-0.002)	2.14 (-0.003)

Note: standard errors in parentheses

Table 11 compares prices of regular gasoline from the first census only by breaking-out the data by brand. Data from the other two censuses provide similar results. The table shows in more detail that hypermarts are pricing the lowest in Nashville. The second lowest pricing group is Other, which consists primarily of independents (i.e. private-branded and unbranded stations[33]). While the mean price of this group is higher than the hypermarts' mean price, it is not statistically significantly higher. Within this group, some independents price quite low. The 5 lowest pricing stations in Nashville at the time of the census were hypermarts, though. Shell is the largest brand in Nashville with 111 stations. It is also the most expensive brand pricing on average ten cents higher than the hypermarts.

[33] There are two major oil company brands within this group: one Conoco station and one 76 station. Since there is only one station of each brand, it did not make sense to separate them into their own groups.

Table 11

Mean Prices of Regular Gasoline by Brand – Census 1: Nashville, TN					
	Mean Price	**s.e.**	**95% C.I.**		**# of Obs.**
Hypermarts	$2.20	$0.02	$2.17	$2.23	29
Other	2.22	0.01	2.20	2.24	75
Marathon	2.24	0.01	2.21	2.27	29
Chevron	2.26	0.03	2.18	2.33	6
Citgo	2.26	0.01	2.24	2.28	74
BP	2.26	0.01	2.24	2.29	53
Phillips	2.27	0.01	2.24	2.29	38
Texaco	2.27	0.02	2.22	2.31	10
Mapco Express	2.27	0.01	2.25	2.28	86
Exxon	2.30	0.01	2.27	2.33	36
Shell	2.30	0.01	2.28	2.31	111
All Stations	2.26	0.00	2.26	2.27	547

Together, Tables 9-11 demonstrate that hypermarts have a substantial market presence in Nashville and that they price lower on average than traditional gas stations.

Estimation

As with Tucson, for each census in Nashville, I run the following regression:

$$p_i = \alpha + K_i\beta + C_i\delta + D_i\gamma + B_i\lambda + \varepsilon_i,$$

where p_i is the price of regular gasoline at each station, K_i is a two-vector that separately counts the number of gas stations within 1 road mile and the number of hypermarts within 2 road miles of each station, C_i is a vector of each station's characteristics, D_i is a vector of measures of demand[34], B_i is a vector of dummy variables indicating the brand for each station, and ε_i is a disturbance term[35]. The regression was run on all stations in the greater Nashville area at the time of the census. There is a difference in how I constructed the distance bands in Nashville as compared to

[34] There are two measures of demand: median income and population density. These variables were obtained from the US Census Bureau and vary at the zip code level.
[35] The standard errors have been corrected for possible heteroskedasticity.

Tucson. In Tucson, I fitted increasing, concentric bands for gas stations and hypermarts. Here, I have only one distance band for gas stations (1 mile) and one for hypermarts (2 miles). These distance band choices better fit the data. Tucson is primarily one city that has sprawled outward from its center. Nashville is quite different. It is a collection of several small towns that have grown together. As a result, gas stations have located in "patches" with substantial space in between, whereas in Tucson stations are more uniformly distributed.

Table 12 presents the complete results of the regression for census 1. The key variables of interest are contained in K_i: the counts of the number of gas stations within 1 road mile and the counts of the number of hypermarts within 2 road miles of each station.[36] The coefficient on the number of hypermarts within 2 road miles is -0.014. This means that adding an additional hypermart within 2 miles of gas station or hypermart decreases that station's price by 1.4 cents, all else equal. This effect is not only statistically significant at the 1% level, but it is economically rather large. As explained in Section 3, net profit margins in the retail gasoline industry are routinely around 1% of sales. As a rough calculation, if the price of gas is $2.50, a gas station only makes 2.5 cents off of each gallon of gas sold. Adding one hypermart nearby the average gas station could reduce the net profit from 2.5 cents per gallon to somewhere around 1 cent a gallon.[37] Even more, some gasoline retailers in Nashville have 2 or 3 hypermarts

[36] Road distances were calculated between each station and every other by creating a program that would link to www.mapquest.com's routing software. A square matrix of over 300,000 distances was created. The matrix is non-symmetrical meaning that the road distance from A to B may be different than the road distance from B to A. An example for the intuition behind this would be two stations on a one-way street where getting from A to B may be easy, but getting from B to A may be quite difficult.

[37] Most gasoline retailers have convenience stores or other revenue generating operations that contribute to their net profit margins. Therefore, one can't simply compute net profit dollars per gallon from the price per gallon of gasoline and the net profit margin. See Section 7 for a more precise description of the economic impact on gasoline retailers.

within 2 road miles. The model implies that having two hypermarts within 2 road miles reduces the competitor's price by 2.8 cents.[38]

Table 12

Regression of Price of Regular Gasoline -- Census 1				
	Coefficient	**Robust s.e.**	**t-stat**	**p-value**
# of Gas Stations w/in 1mi	-0.001	0.001	-0.45	0.652
# of Hypermarts w/in 2mi	-0.014	0.005	-2.83	0.005
Convenience Store	0.004	0.014	0.33	0.745
Franchise Food	-0.027	0.014	-1.90	0.058
Car Wash	0.006	0.011	0.54	0.591
Repair Shop	0.031	0.015	2.04	0.042
Pay at Pump	-0.001	0.012	-0.11	0.912
ln(# of Pumps)	-0.018	0.008	-2.14	0.032
Median Income	0.000	0.000	4.79	0.000
Population Density	0.000	0.000	6.90	0.000
Raceway	-0.073	0.039	-1.89	0.059
Swifty	-0.050	0.033	-1.53	0.126
Kangaroo	-0.047	0.022	-2.11	0.036
Hypermart	-0.033	0.024	-1.39	0.165
Marathon	0.004	0.016	0.22	0.824
Mapco	0.016	0.013	1.20	0.231
Chevron	0.010	0.028	0.35	0.729
Citgo	0.012	0.013	0.92	0.356
Texaco	0.018	0.020	0.91	0.363
Phillips	0.024	0.016	1.54	0.125
BP	0.025	0.015	1.59	0.113
Shell	0.052	0.013	3.94	0.000
Exxon	0.066	0.018	3.74	0.000
Constant	2.200	0.022	99.9	0.000
# of Observations	547			
F(23,523)	8.73			
R-Square	0.26			
Root MSE	0.08			

Table 13 compares the main cross-sectional regression results for each of the three censuses.[39] In Nashville, in contrast to Tucson, the number of gas stations within 1 road mile is not statistically different than zero in any of the regressions. The number of

[38] For both Tucson and Nashville, I initially expected the impact of adding an additional competitor to be diminishing as more competitors are added. For example, I suspected the marginal impact of adding a second competitor would be smaller than the marginal impact of adding the first. The model to me otherwise; it better fit the data when I allowed the marginal competitor to have the same impact as the previous.

[39] For each census I performed the same regression as in Table 12.

hypermarts within 2 road miles becomes stronger (an increase from -0.14 to -0.16) and even more statistically significant in the second and third censuses. The second census contains two new hypermarts, and the third census has three new hypermarts.[40] The hypermart dummy, which was not statistically different than the baseline unbranded stations in census 1, is statistically lower than the unbranded stations in censuses 2 and 3. For all three censuses, the impact of a hypermart on a competitor is statistically significantly different than that of a traditional retailer on a competitor at the 1% level.[41] In sum, the empirical evidence presented in Tucson and Nashville show that i) hypermarts price lower on average than most other stations ii) hypermarts depress prices of nearby competitors substantially more than traditional retailers do and in an economically significant way and iii) the impact of hypermarts on competitors stretches over a farther distance than traditional retailers.

Table 13

Comparison of Key Variables Across Censuses: Nashville, TN				
		Coefficient	**Robust s.e.**	**p-value**
Census 1	**# of Gas Stations w/in 1mi**	-0.001	0.001	0.652
	# of Hypermarts w/in 2mi	-0.014	0.005	0.005
	Hypermart Dummy	-0.033	0.024	0.165
Census 2	**# of Gas Stations w/in 1mi**	0.000	0.001	0.578
	# of Hypermarts w/in 2mi	-0.016	0.003	0.000
	Hypermart Dummy	-0.062	0.014	0.000
Census 3	**# of Gas Stations w/in 1mi**	-0.001	0.001	0.634
	# of Hypermarts w/in 2mi	-0.016	0.004	0.000
	Hypermart Dummy	-0.036	0.017	0.035

Section 6: The Entry of The Home Depot

[40] Two Home Depot gas stations were opened between census 1 and census 2. A Costco and two Krogers built new stores and gas stations between census 2 and census 3.
[41] Wald tests for differences in coefficients for the three censuses follow. Census 1: F(1,524) = 6.50, p-value = 0.011; Census 2: F(1,534) = 32.90, p-value = 0.000; Census 3: F(1,535) = 11.26, p-value = 0.001.

One could argue that the cross-sectional evidence presented above is endogenous. Specifically one could contend that gasoline retailers play a two-stage game. In the first stage retailers choose where to locate and in the second-stage they simultaneously choose prices based off of the first stage location decisions. If this is the case, the impact of another station on a competitor's price could be biased. Following the sequential entry and pricing reasoning, retailers presumably would tend to locate more in areas where prices are higher and are thus more profitable. The two-stage game, therefore, would imply that in areas where we observe more stations we should also observe higher prices. The results presented above, reveal just the opposite. I have found that in areas where there are more competitors, prices are lower, all else equal. If I have omitted important entry variables from my equation, any potential endogeneity would bias the estimated coefficients upward. This would mean that the impact of hypermarts is actually stronger (more negative) than what is presented above.

In an attempt to more rigorously address this possibility, I exploit a natural experiment where The Home Depot entered the retail gasoline industry. The Home Depot recently has realized what other big-box stores, discount stores, and mass-merchandisers like Wal-Mart have – that it potentially can increase total store profit by selling gasoline at relatively low prices outside its stores. Initially The Home Depot ran a corporate experiment at two of its stores' locations in the Nashville, TN area to test the profitability of the gas stations and to determine whether to move more aggressively into the industry. It opened one store in Brentwood, TN and another in Hermitage, TN (both suburbs of Nashville). Since the initial test, and at the time of this writing, The Home Depot has opened two more gas stations in the Atlanta, GA area[42] and one more in the

[42] Atlanta, GA is the corporate headquarters of The Home Depot.

Nashville, TN area suggesting it has found what other hypermarts have found -- that selling gasoline can contribute positively to store profits. If selling gasoline turns out to be a successful venture, The Home Depot thinks at least 300 stores are good candidates to open gas stations at indicating that The Home Depot could be a significant player in the retail gasoline industry in the future as other hypermarts already are.[43]

I am able to use the data set that I collected in Nashville to exploit the entry of the initial two The Home Depot gas stations.[44] [45] This data set is advantageous for several reasons. First, it collects data at three separate time periods: once before the two stores entered, once shortly after the stores entered, and lastly just under a year after the stores entered. Consequently, I observe the market before The Home Depot's entry, the initial response of the market to the entry, and longer-term effects of the entry on the market. Second, the data set is a census of prices and characteristics for the greater Nashville area as opposed to a sample of stations in the larger market. Thirdly, I am able to analyze the entry in a natural experiment setting. The Home Depot used existing stores in established areas of the city to open the gas stations. This is preferable to opening brand-new stores and gas stations in relatively new or expanding areas of town where entry could be more favorable in the short-run (say, as businesses are continuing to be built to service the new population) and potentially confound the analysis. Lastly, the stations were opened in

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[43] "Home Depot Begins Selling Gasoline Diesel." *Platts Oilgram Price Report*, February 10, 2006 Friday, Market by Market; Pg. 12, Beth Evans.

[44] At first, The Home Depot announced plans to open four gas stations at existing stores in the greater Nashville area in December 2005. After conducting my first data collection project, The Home Depot announced the stores were being delayed. One was to open in February 2006, another in March 2006, and the other two in June 2006. After opening the first two stations, The Home Depot then announced the two June stations would be opening in the Atlanta, GA area, no longer in Nashville, at a later date. The first of those stores opened in September 2006 in a suburb outside of Atlanta.

[45] Hastings (2004) exploited a natural experiment in a similar manner as I do. She analyzed the acquisition of an independent gasoline retail chain by Arco (a major oil company) and found that local retail gasoline markets became less competitive after the acquisition.

areas where several other gasoline retailers existed nearby, thereby allowing me to analyze the price response of the nearby competition to the entry.

My methodology is to compare the prices of gas stations near where The Home Depot stations entered, both before and after its entry, to the prices of stations farther away. One would expect the prices of the stations nearby to go up less (down more) relative to the stations farther away if the overall level of prices went up (down) in Nashville. Findings of such a result would be strong evidence of the impact big-box stores and mass-merchandisers have on smaller, more traditional gasoline retailers.

I run the following regression:

$$P_{Cen2i} - P_{Cen1i} = \alpha + T_i\beta + \varepsilon_i .$$

In words, I regress each station's price change between census 2 and census 1 on two treatment dummies. The first treatment dummy takes the value of 1 if a station is located within two road miles of The Home Depot gas station that entered in Brentwood, TN and is 0 otherwise. The second treatment dummy is 1 if a station is within two road miles of The Home Depot that entered in Hermitage, TN.[46] Stations that are not within two road miles of either The Home Depot are in the control group. Since the gasoline market is dynamic and constantly changing, there was some entry, exit, rebranding, etc. among other stations in Nashville in the time between the two censuses. Therefore, I limited the control group to only stations that were *not* within two road miles of stations that had some change in characteristics, other than price, (e.g. rebranded, entered, or exited)

[46] I also ran the regression on just one treatment dummy, which equaled 1 if a station was within two road miles of either of the two The Home Depot stations. Breaking the treatment into two dummy variables reveals interesting differences between the effects in the two areas of entry.

between the two censuses.[47] Including these stations in the control could potentially confound my results.

Table 14 presents the results of the regression. This first thing to notice is the large negative coefficient on the Brentwood treatment. The coefficient says the price change for stations near the Brentwood Home Depot gas station was 14 cents lower than the price change for stations in the control. This result is significantly strong both statistically and economically. Fourteen cents is a huge decrease in price for a gas station. It was told earlier that gas stations typically operate on net profit margins of 1% of sales. A sustained price decrease of this magnitude would surely drive not just marginal stations, but average stations far into the red making most stations unprofitable.

Examining the Hermitage treatment dummy yields a strikingly different result, though. The prices of gas stations near the Hermitage Home Depot actually increased relative to the control group between the two censuses (a coefficient of 0.04). This result perplexingly suggests that the entrance of The Home Depot was actually advantageous for the stations nearby as they saw their prices increase by four cents.

Table 14

Regression of Price Change on Home Depot Treatment Dummies -- $P_{Census2}$ - $P_{Census1}$ (n=415)						
	Coefficient	**s.e.**	**t-stat**	**p-value**	**95% C.I.**	
Brentwood HD Treat (n=6)	-0.135	0.034	-3.94	0.000	-0.202	-0.068
Hermitage HD Treat (n=12)	0.043	0.024	1.78	0.076	-0.005	0.091
Constant	0.242	0.004	57.83	0.000	0.233	0.25

As a researcher, I am left with trying to explain the difference in the effects of the two stations' entry. One potential explanation might be found by looking at the time the censuses were taken. The first census was taken in November 2005 before either Home

[47] Of the 544 stations that were operating at the time of both census 1 and 2, 415 stations are in the regression. Six stations are within two road miles of the Brentwood Home Depot, twelve are within two road miles of the Hermitage Home Depot, and 397 are in the control group.

Depot station had entered. The Brentwood Home Depot station entered in early February 2006. The Hermitage Home Depot entered in March and census 2 was taken at the end of March 2006 only a couple of weeks after the Hermitage station entered. Perhaps the census was taken too near to when the Hermitage station opened. Perhaps many consumers didn't yet know about the new station and hadn't began using the station, and subsequently, hadn't yet forced nearby stations to respond. If this is the case, one should be able to look at a later date and would expect to find the price decrease then.

Table 15 presents the results of the regression of the price change between censuses 3 and 2 on the Home Depot treatment dummies. Census 3 was taken in January 2007 about 9 months after the Hermitage Home Depot entered. The control group in this regression is different than the control in the regression in Table 14 because some gas stations have entered, exited, and rebranded elsewhere in the Nashville area between census 2 and census 3. However, the idea is still the same in that the stations in the control are those stations that are *not* within two road miles of a station that had some change, other than price, between the two censuses.[48] Table 15 shows that the stations near the Hermitage Home Depot did not see their prices decline relative to the control. In fact, as seen in Table 15, just the opposite happened. Their prices increased by 5 cents relative to the control. This finding is inconsistent with the explanation that at the time census 2 was taken consumers had not had time to learn about the Hermitage Home Depot's entrance, change their behavior, and subsequently force nearby stations to respond by lowering their prices.

[48] The control group in this regression contains only 263 stations, where the control group for the regression in Table 6 contained 397 stations. There are fewer stations here because Kwik Sak, a local business group, purchased and rebranded 23 Marathon gas stations between censuses 2 and 3. All stations nearby one of these stations are no longer in the control.

Table 15

Regression of Price Change of Home Depot Treatment Dummies -- $P_{Census3}$ - $P_{Census2}$ (n=280)						
	Coefficient	**s.e.**	**t-stat**	**p-value**	**95% C.I.**	
Brentwood HD Treat (n=5)	0.110	0.029	3.75	0.00	0.052	0.167
Hermitage HD Treat (n=12)	0.052	0.020	2.60	0.01	0.013	0.092
Constant	-0.355	0.004	-80.96	0.00	-0.363	-0.346

Of further note, Table 15 reveals that gas station prices increased by 11 cents relative to the control for those stations near the Brentwood Home Depot. Interestingly, one station about ¾ of a mile away from where the Home Depot entered went out of business between censuses 2 and 3. Finding that prices increased between censuses 2 and 3 in Brentwood, therefore, is not too surprising. Initially after Home Depot's entry in Brentwood, station prices fell by 14 cents. These low prices were profitably unsustainable forcing one firm to exit the market. Prices then increased by 11 cents, ultimately resting about 2.5 to 3 cents lower than the control. Two-and-a-half to three cents is a much more reasonable price decrease for the local market and is more consistent with the one-and-a-half to two cent price decreases associated with hypermarts found in the cross-sectional regressions in Tucson and Nashville.

On the whole, results from the natural experiment of The Home Depot's entry are mixed. Brentwood behaves much as would be expected and supports earlier findings; however, Hermitage defies intuition with its large price increases. In order to explain the price increases in Hermitage, one would need to point to a specific factor that changed systematically over time in this local market and not across Nashville in general. This criteria rules out almost all stories that could be attributed to changes in cost. Perhaps there was a large increase in demand in the Hermitage area relative to other areas. This, for sure, is a possibility, but it is difficult to attribute a source to it. Hermitage is a fairly well-established suburb to the east of Nashville with other suburbs even east of it. Hermitage, and Nashville on the whole, are cities where population has remained fairly constant in recent years unlike some cities in the western US. Further, there does not seem to be a large income increase in the Hermitage market that would not be present in other parts of the city. Another demand-side explanation could be an increase in traffic-flow in the area. I do not have data on traffic-flow in Nashville, but my inclinations from observing the area are that this is unlikely. A final potential explanation, which neither has to do with cost nor demand, could be price cycles such as those found in Eckert (2002) and Noel (2007) in select cities in Canada. If price cycles are present in Nashville, one could rationalize these results. It wouldn't so much be that prices increased in the Hermitage area (or decreased in the Brentwood area for that matter), rather it would be that the censuses were taken at unfortunate times. It may have just been bad coincidence that the first census was taken when the Hermitage area was in the low part of its price cycle, while censuses 2 and 3 were taken when the area was experiencing a high price cycle.

Section 7: Economic Significance of Hypermart Entry

On the whole, all the results presented in this paper from two separate cities suggest that hypermarts decrease the prices of nearby competition by 1.4 to 2.5 cents, with the exception of the Hermitage Home Depot. Indeed, price impacts of this magnitude are economically meaningful to retailers. Data from FRMC show that an average gasoline retail outlet in 2006 sold 1,300,000 gallons of gasoline (about 108,000 gallons per month). On sales of those gallons the typical retail station made $170,500 gross profit dollars (13.12 cents per gallon), which contributed to $35,000 in total station pretax profit (0.76% of sales). If a hypermart were to open nearby the average gas station, as a lower bound, the results suggest the station's margin would fall by 1.4 cents from 13.12 cents per gallon to 11.72 cents per gallon. This in turn would decrease fuel gross profit dollars to $152,000 and total store pretax profit from $35,000 to $16,800 (0.36% of sales). How meaningful is this? Being forced to compete with a hypermart cuts an average station's profit in half. As an upper bound, a hypermart could reduce a station's margin by 2.5 cents per gallon cutting its margin from 13.12 to 10.62 cents per gallon. This in turn would drop gross profit dollars from fuel sales to $138,000 and pretax profit to only $2,500 (0.01% of sales). In the upper bound case, a hypermart would take an average gasoline station and make it a virtual break-even gas station.

As hypermarts continue to expand and capture more market share, clearly, many retailers will be driven to unprofitable conditions, not just marginal ones. What's more, if a traditional retailer is located near two (three) hypermarts, the downward effect on profit is doubled (tripled). Being located near two or more hypermarts makes it in all manners impossible for an average retailer to remain profitable, even using the lower bound price impact estimate. Being located near more than one hypermart is not an implausible scenario. In Nashville 8.6% of all retailers are located within 2 miles of two or more hypermarts (7.3% are located near two hypermarts and 1.3% near three) and in Tucson 6% of all retailers are located within 2 miles. These firms, undoubtedly, must be much more efficient in their operations than the average station to remain solvent. Taken as a whole, price impacts of this magnitude will place substantial pressure on traditional retailers and will force many to exit the market.

Section 8: Conclusion

This paper examines competition between small firms and large, multi-product firms within the context of the retail gasoline industry. Its adds to the existing literature in two primary ways. First, the paper develops a simple discrete-choice, random utility model. The model shows that there is a spillover in the profit function between the hypermarts' two products' market shares. This spillover is absent in the profit function of the small firm. If the spillover is sufficiently large, it is profit-maximizing for the hypermart to price its gas lower than what is optimal for the gas station. This result is especially useful in explaining why hypermarts price lower than most gas stations in the US. It is also consistent with the literature that shows certain products can be sold as loss-leaders by multi-product firms.[49]

Secondly, this paper analyses the price impact that the recent emergence of big-box, grocery, discount, and club stores selling gasoline (hypermarts) have had on traditional gasoline retailers. The gasoline industry is currently experiencing what many Mom-and-Pop stores experienced with Wal-Mart a few decades ago. Gasoline industry analysts have maintained that hypermarts price low and thereby force nearby gas stations to respond by slashing their prices to unprofitably low levels. The recent and rapid growth of hypermarts has caused considerable trepidation for traditional gasoline station owners as many fear they will be unable to compete in a world where hypermarts command a substantial portion of industry market share.

This paper cross-sectionally examines approximately 235 gas stations in Tucson, AZ and 550 in Nashville, TN. I find that hypermarts do price lower than their counterparts and also find that as the number of hypermarts increase, prices are forced

[49] My model does not require gasoline to be sold below cost. The loss-leader literature typically assumes complementarities between the two goods. I do not make such an assumption here. For representative loss leader articles see Hest and Gerstner (1987); Chevalier, Kashyap, and Rossi (2003); Nevo and Hatzitaskos (2005); and DeGraba (2006),

downward for nearby retailers. Not only is the price depression statistically significant at conventional significance levels, but it is economically significant too. On average, if a gas station is located within 2 road miles of a hypermart, the station's price is pushed down about 1.5 cents cents. This amount is substantially more than a traditional gas station would inflict on other gas stations in the market.

The paper also analyzes the effect of the entry of two The Home Depot gas stations at existing stores in the Nashville area. I find that at one station the prices of nearby competitors are pushed down initially by 13.5 cents relative to the control as the stations compete for market share. One nearby competitor is actually forced to exit the market. Prices then climb back up by 11 cents relative to the control, ultimately resting at 2.5 cents lower than they were before the entry. Results near the other Home Depot entrant are strikingly different. Nearby stations there saw their prices actually increase relative to the control.

Overall, it is estimated that retailers operate on small net profit margins. Therefore, gas stations have very little room for their prices to be pushed down any farther. As hypermarts continue to enter, undoubtedly, some retailers will be forced to exit the market. This occurrence in the retail gasoline industry is representative of a larger trend. Societies globally are experiencing an unprecedented increase in low priced, one-stop-shopping big-box stores and mass-merchandisers. Inevitably along the way, smaller, often more nostalgic firms are left struggling for survival in the wake as they adapt to more competitive business environments. How the retail gasoline industry will continue to evolve in light of hypermart entry is of substantial interest.

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