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MICHIGAN GASOLINE PRICING AND THE MARATHON-ASHLAND AND ULTRAMAR DIAMOND SHAMROCK TRANSACTION

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Michigan Gasoline Pricing and the Marathon - Ashland and Ultramar Diamond Shamrock Transaction

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Abstract: Marathon Ashland Petroleum's (MAP) 1999 acquisition of the Michigan assets of Ultramar Diamond Shamrock (UDS) increased MAP's share of terminal storage in Michigan from about 16 percent to about 25 percent and increased the share of gasoline stations bearing a MAP brand from about 16 percent to about 24 percent. In this paper, we examine whether this acquisition affected the retail price of gasoline. We use a difference-in-differences model to compare price movements in six Michigan cities affected by the acquisition with price movements in two nearby cities unaffected by the acquisition. Using this model, we find no evidence that this acquisition led to higher prices for consumers.

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[1] The authors are economists at the Federal Trade Commission. Views and opinions expressed in this paper are solely those of the authors and should not be interpreted as reflecting the views of the Federal Trade Commission, any of its individual Commissioners, or other members of the staff. Comments by Daniel Hosken, Jeffrey Fischer, Robert McMillan and Louis Silvia and excellent research assistance by Anthony Alcorn are appreciated.

I. Introduction and Literature Review

Since the late 1990s, many large oil companies have combined with other large oil companies through a series of mergers and acquisitions. While these firms claim that these transactions have benefitted society by generating billions of dollars in cost savings,[1] others claim that these mergers and acquisitions have harmed society by enabling the firms to raise gasoline and diesel prices. This paper seeks to help differentiate between these two claims by examining the effect on retail gasoline prices of one particular acquisition, Marathon Ashland Petroleum's (MAP) 1999 acquisition of the Michigan assets of Ultramar Diamond Shamrock (UDS).

MAP's acquisition of UDS's Michigan assets, which was not challenged by the government, is a good candidate for study because it had a much larger effect on wholesale and retail concentration than more prominent petroleum mergers such as Exxon's merger with Mobil. The acquisition increased MAP's share of terminal storage in Michigan from about 16 percent to about 25 percent and increased the share of gasoline stations bearing a MAP brand from about 16 percent to about 24 percent. In contrast, the Federal Trade Commission required Exxon and Mobil to divest sufficient distribution and retailing assets to ensure that concentration stayed the same in most of the companies' overlapping businesses.[2]

Previous studies of the price effects of oil mergers can be divided into two categories. The first set of papers (United States Government Accountability Office (GAO) (2004), Chouinard and Perloff (2004)[3]), examines the effect of multiple mergers on a broad cross section of markets over time and concludes that some oil mergers led to higher prices. In our view this approach is poorly suited to examining the price effects of oil mergers. Various localities have

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[1] See ExxonMobil Corporation, Investor and Media Meeting, New York, August 1, 2000, pp. 36-37; Remarks by David J. O'Reilly, Chairman and CEO Chevron Texaco Corporation at the 2003 Annual Meeting of Stockholders Midland, Texas May 22, 2003 (www.chevrontexaco.com/news/speeches/2003/22may2003.oreilly.asp); Conoco Phillips 2003 Annual Report.

[2] See http://www.ftc.gov/opa/1999/11/exxonmobil.htm

[3] The working paper version of this paper, Chouinard and Perloff (2003), includes a more detailed discussion of how mergers and divestitures were modeled.

adopted different fuel specifications to comply with environmental regulations. For example, a seven-county area centered on Detroit uses a different type of gasoline (low Reid Vapor Pressure conventional) than all of Ohio, most of northern Indiana, and the rest of Michigan. This balkanized nature of gasoline demand, along with constraints on the refining capacity and pipeline capacity that can supply an area, means that local supply and demand conditions often play an important role in determining price. For instance, a pipeline rupture might drive up prices in one city while leaving prices in a city 200 miles distant unchanged. Identifying and controlling for all of the local supply and demand shocks is very time-consuming where a single merger affects a small group of markets. Where many mergers affect many markets, we suspect that this task is unmanageable. For this reason, we believe that those papers that examine the effect of many oil mergers in many markets run a serious risk of wrongly attributing to a merger a price increase or decrease that was caused by a local demand or supply shock.

A second set of papers (Hastings (2004), Hastings and Gilbert (2002), Taylor and Hosken (2004)) examines the price effects of specific mergers. By focusing on the effect of a specific merger in a small number of markets, these papers are better able to identify and account for local supply and demand shocks. Hastings (2004) examines ARCO's 1997 long-term lease of 260 gasoline stations in Southern California from Thrifty. She finds that competing stations increased their price by 5 cents per gallon when ARCO converted the Thrifty stations to the ARCO brand. Based on this, she argues that independent retailers, such as Thrifty, play a disproportionately large role in ensuring competition. Hastings and Gilbert (2002) examine Tosco's 1997 purchase of three refineries, 1,100 gasoline stations, and related terminal and transportation assets from Unocal. Prior to this transaction, Tosco operated two refineries on the West Coast but had few retailing assets. Focusing on the vertical aspect of this acquisition, Hastings and Gilbert find some evidence that Tosco set higher wholesale prices in those markets where its newly-acquired retail assets competed most intensely with independent retailers. Hastings and Gilbert, however, do not examine the overall effect of this acquisition on wholesale or retail gasoline prices. Taylor and Hosken (2004) examine the effect of the 1998 joint venture between Marathon Oil Corporation and Ashland Inc. on retail gasoline price in Louisville,

Kentucky. Although this joint venture significantly increased concentration in Kentucky,[4] Taylor and Hosken find it had no significant effect on retail gasoline prices in Louisville. While Taylor and Hosken find some evidence of higher wholesale prices following the joint venture, they conclude these higher wholesale prices were unrelated to the joint venture.

This paper complements this second set of papers in two respects. First, by examining another merger, this paper provides an additional case study with which to judge the price effects of mergers. Second, by providing detailed information about the pre-merger competitive environment, this paper enables the reader to relate these price effects to the acquisition's effect on market structure. This paper is structured as follows. Section II describes the effect that this acquisition had on market structure in the supply of refined products into Michigan, the distribution of wholesale gasoline in Michigan, and the sale of gasoline in several metropolitan statistical areas in Michigan. Section II also discusses possible ways in which these changes in market structure might lessen competition. Section III discusses the data and the methodology used to examine this acquisition's effect on retail gasoline prices. We present our results in section IV and offer several concluding comments in section V.

II. MAP's acquisition of UDS

MAP's acquisition of UDS's Michigan assets substantially increased MAP's share of terminal capacity in Michigan and substantially increased the number of gasoline stations in Michigan carrying a MAP brand.[5] The following paragraphs describe several ways in which this could lead to higher gasoline prices.

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[4] According to Taylor and Hosken, this transaction increased the Herfindahl-Hirschman Index (HHI) in the state of Kentucky by about 880 points to 2263 for gasoline wholesaling and by about 250 points to about 1550 for gasoline retailing.

[5] MAP's acquisition of UDS's Michigan assets apparently had little direct effect on the supply of refined products into Michigan. In October 1999, UDS closed its 50,000 barrel-a-day refinery in Alma, Michigan after unsuccessfully trying to sell it for a year (Ultramar Diamond Shamrock 2000 10K; Kronenwetter, Eric, "Ventech Gets Ready for Refinery Cannibals," The Oil Daily, June 15, 1999, No. 113, Vol 49). As part of its acquisition of UDS's Michigan assets, MAP acquired a pipeline system that served this refinery. MAP immediately sold this system to the Wolverine Pipeline Company (Wolverine), which then connected the UDS pipeline system to its main pipeline. (See Figure 1)

A refined products terminal (terminal) is basically a set of large tanks where refined products are stored, combined with any desired additives, and dispersed into trucks that supply gasoline stations and other commercial customers. Prior to MAP's acquisition of UDS, thirty-four terminals served Michigan. MAP operated six of these terminals accounting for about 16 percent of the terminal storage capacity in Michigan, and UDS operated three of these terminals accounting for about 9 percent of the terminal storage capacity in Michigan. Figure 2 shows the location and ownership of the terminals in Michigan, and Table 1 lists the capacities, market shares, and supply sources of these terminals.

Terminals typically supply gasoline stations within a 50-75 mile radius. Thus, two terminals located 100 to 125 miles apart might compete to supply the gasoline stations that are located between them (FTC 2004, p. 219). Given this and the terminal locations shown in Figure 2, MAP's acquisition of UDS could have reduced localized competition among terminals in the area surrounding Grand Rapids and the area surrounding Lansing, Flint, and Bay City.[6] In the Grand Rapids area, the MAP terminal in North Muskegon may have competed with the UDS terminals in Lansing and Traverse City. In the area comprising the cities of Lansing, Flint, Saginaw, Bay City, and Midland, the MAP terminal in Flint may have competed with the UDS terminals in Lansing and Bay City. This localized competition would be more significant than figure 2 implies if, as some evidence suggests, the MAP and UDS terminals were more willing than other terminals to serve independent dealers.[7] MAP's acquisition of UDS's Michigan assets might have also facilitated coordinated behavior among the terminals in the two regions by reducing the number of firms that would need to coordinate their behavior.

Approximately 5300 gasoline stations served Michigan at the time of the acquisition (FTC 2004, p.239). About 24 percent of these stations operated under either a MAP or UDS brand: UDS owned 179 stations and had contracts to supply another 240 stations that operated

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[6] Pinske, Slade and Brett (2002) found that the competition among gasoline terminals was localized. Shapiro (1996) and Willig (1991) provide a theoretical discussion of how mergers can reduce localized competition.

[7] Testimony of Michigan Attorney General Granholm before U.S. Senate; testimony of Michael D. Swan before Federal Energy Regulatory Commission, Docket No. OR99-15 (Wolverine Pipe Line Company).

under the UDS brand;[8] MAP owned and operated 214 Speedway SuperAmerica stations and had contracts to supply another 619 stations that operated under the Marathon Ashland brand.[9]

Geographic markets for gasoline retailing are almost certainly no larger than a metropolitan area since few people commute outside of a metropolitan area on a regular basis. Consistent with this, previous studies of gasoline retailing have defined geographic markets as metropolitan areas or smaller (e.g., Slade (1992), Hastings (2004), Borenstein & Shepard (2001)). Table 2, which is compiled from phone book listings from 1999, records the number of stations by brand affiliation for several Michigan metropolitan statistical areas (MSAs). According to Table 2, MAP's post-acquisition market share (measured as the number of stations bearing a MAP affiliated brand) was about 30 percent in the Lansing and Flint MSAs, was almost 20 percent in the Bay City and Kalamazoo MSAs, and was 12 and 13 percent respectively in the Grand Rapids and Jackson MSAs. While there were a sizeable number of stations not listing a brand affiliation, we believe that the figures for MAP and UDS are accurate since they are consistent with statewide figures.

Given the environment described above, MAP's acquisition of UDS's Michigan gasoline stations could lead to higher prices in several ways: The acquisition could eliminate localized competition between gasoline stations supplied by MAP and gasoline stations supplied by UDS; the acquisition could also facilitate coordinated interaction by reducing the number of competitors; and the acquisition could lead to higher prices by prompting the combined firm to restrict access to its terminals thereby raising the costs of its independent rivals.

III. Methodology and Data

Methodology

To examine whether the changes in market structure described above led to higher retail gasoline prices, we need to isolate the effect of this acquisition from the effect of changes in the

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[8] http://www.marathon.com/News_Center/Press_Releases/1999_News_Releases/?releaseid=245674

[9] Branded Retail Outlets in the United States, 1998, National Petroleum News, Mid-Jul99, Vol. 91 Issue 8, p.42.

demand or supply of gasoline and the effect of other changes in market structure. Previous studies of consummated mergers have employed two basic methods to control for other factors that affect price. The first method identifies those cost and demand factors that affect price and then regresses price on these factors and a dummy variable accounting for the merger (e.g., Schumann et al. 1997; Schumann et al. 1992). This method is not feasible in this case because data on the various supply and demand factors affecting price are largely unavailable on a weekly or monthly basis at a city level. The second method uses a difference-in-differences (DID) approach to compare price changes in a market where a merger occurred (treatment market) with price changes in a market with similar demand and cost conditions where no merger occurred (control market) (e.g., Kim and Singal (1993), Barton and Sherman (1984)). We use this approach in this paper.

As described by the equation below, we assume that prices in the treatment city are explained by the acquisition, supply and demand shocks shared with the control cities, and supply and demand shocks unique to the treatment cities. The specific supply shock dummy variables are described in detail below. Because the error term of the equation is autoregressive, we estimate it using an AR(1) correction.[10]

$$P^T - P^C = \alpha + \beta_1 MERGER + \beta_2 RUPTURE + \beta_3 LEMONT + \beta_4 MIDWEST + \epsilon$$

where: P^T - price in the treatment city

P^C - price in the control city

α - constant

MERGER - a dummy for the post-acquisition period (12/13/1999-12/31/2002)

RUPTURE - a dummy for the Wolverine Pipeline disruption (6/7/00 to 8/31/00)

LEMONT - a dummy for the Citgo Lemont refinery disruption (8/13/01-10/8/01)

MIDWEST - a dummy for the Midwest gas price spike (5/20/00-6/7/00)

ϵ - error term

MAP's acquisition of UDS's Michigan assets changed market structure in the Flint, Lansing, Saginaw-Bay City, Grand Rapids-Muskegon, Jackson, and Kalamazoo-Battle Creek

MSAs. These six MSAs are our treatment cities. For the DID approach to isolate the acquisition's effect on gasoline prices in these cities, three conditions must hold. The treatment and control cities must experience the same supply and demand shocks. The transmission of supply and demand shocks must be the same in the treatment and control cities. And, the treatment and control cities must be free of any other significant changes in market structure. The next subsection notes that we can largely meet these three conditions through our choice of control cities. The subsection after that describes the several remaining confounding factors.

Choice of Control Cities

Two cities, South Bend and Elkhart-Goshen, appear to largely meet the requirement of experiencing the same supply and demand shocks as the treatment cities. Grand Rapids-Muskegon, Jackson, and Kalamazoo-Battle Creek all obtain refined products through pipelines originating in the areas around Chicago, Illinois. Lansing and Saginaw-Bay City also obtained refined products through these pipelines after the closure of the Alma Refinery. These pipelines serve the South Bend and Elkhart-Goshen MSAs in Indiana before they reach metropolitan areas in Michigan. Like all of the treatment cities, South Bend and Elkhart-Goshen use conventional gasoline. Thus, these two control cities should experience most of the same supply shocks as the treatment cities. These cities should also experience the same demand shocks as the treatment cities since they are geographically close and thus will experience the same regional economic effects.

Detroit and Toledo, while geographically close, do not appear to meet the requirement of experiencing the same supply shocks as the treatment cities. Detroit uses a different formulation of gasoline than the treatment cities. (Moreover, it also may have been affected by the merger).[10] The Buckeye Pipeline, the major pipeline transporting refined products from Toledo to Flint and

[10] The results when using Detroit as a control city were very similar to the results from using the other control cities. MAP and UDS also posted prices in Detroit along with 10 other firms. Using Detroit as a treatment city and comparing it to the control cities showed no change in pricing.

Bay City, is apparently at capacity.[11] Since the Buckeye Pipeline is likely not the marginal source of supply to any of the treatment cities, the treatment cities likely would experience different supply shocks than Toledo.

To address the requirement that the transmission of supply and demand shocks be largely the same in the treatment cities and control cities, we do two things. First, we ensure that there are no huge obvious differences between the treatment cities and the control cities in the intensity of rivalry among producers: All of the treatment and control cities are within 75 miles of at least three terminals. Second, we compare each of our six treatment cities with two control cities. To the extent that the transmission of supply and demand shocks differ for the treatment and control cities, we would expect that the transmission would be greater for treatment cities in some cases and greater for control cities in other cases. In other words, while differences in the transmission of supply and demand shocks between a treatment city and a control city might bias the DID results for a single pairing, this bias should not be systematic. Thus, if we observe that the prices in the treatment cities did not increase relative to the price in the control city in any of the twelve combinations, then we can conclude that the merger did not have a broad anticompetitive effect. However, if we observe that the price in the treatment city increased relative to the price in the control city in nearly all of the twelve combinations, then the merger would seem to have decreased competition in at least some cities.

To address the requirement that the control city be free of any treatment, and the related requirement that the treatment city be free of any treatment other than the acquisition, we examined whether any other changes in market structure occurred in the control cities and treatment cities during the period we study. Other than MAP's acquisition of UDS's Michigan assets, we are unaware of any major change in market structure in any control or treatment city. Several minor changes in market structure are briefly discussed in the next subsection.

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[11] See infra. Also, the relationships between the retail price in Toledo and the retail prices in Detroit, Flint, and Bay City were not stable either before or after the acquisition. This provides further support for the view that Toledo was not the marginal source of supply to these areas.

Treatment of Confounding Factors

While we can select control cities that will experience most of the demand and supply shocks experienced by the treatment cities, a few factors affecting supply that are specific to the treatment cities remain. First, the source of supply for two terminals changed at about the same time as the acquisition. Prior to late 1999, UDS's Alma refinery supplied the UDS terminals in Lansing and Bay City. After early 2000, Wolverine supplied these two refineries through a pipeline that it purchased from UDS and connected to its main pipeline. In an application to expand the capacity of the former UDS pipeline, Wolverine claimed that UDS's closure of its Alma refinery created a shortage of refined products in southeastern and central Michigan which the former UDS pipeline lacked the capacity to offset.[12] Wolverine further claimed that the Buckeye Pipeline, which also serves Bay City, operates near its capacity and thus the marginal demand in southeastern and central Michigan must be met by either truck transport or barge transport, both of which have a higher marginal cost than pipeline transport.[13] As of November 2004, Wolverine had not secured the necessary regulatory approvals to add this capacity.[14]

It is difficult to judge the validity of Wolverine's claim that the closure of the Alma refinery reduced the supply of refined products into central Michigan since firms keep data on transport through pipelines and terminals private. However, Wolverine's website currently lists

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[12] UDS's closure of its Alma refinery appears to be unrelated to this acquisition. In mid-1999, UDS decided to close its Alma refinery after unsuccessfully trying to sell it for a year. (See footnote 5) UDS's closure of its Alma refinery is consistent with a nationwide trend toward consolidating refining capacity at fewer but larger refineries. Smaller refineries operate at a cost disadvantage because of their lower scale of operation. In some cases where a small refinery is near both crude oil supplies and areas that consume refined product, this cost disadvantage may be offset by lower transportation costs (FTC 2004, pp.179-180). In the case of the Alma refinery, crude oil was produced nearby, but the production of this crude oil was falling sharply: Michigan crude oil production decreased from over 38 million barrels in 1979 to under 7.5 million barrels in 1999 (Energy Information Administration, U.S. Department of Energy, *Petroleum Supply Annual*, various issues).

[13] In the matter of the application of Wolverine Pipe Line Company to construct, operate, and maintain a combination 12-inch and 16-inch outer diameter liquid petroleum products pipeline system in Jackson, Ingham, and Clinton Counties, Case No. U-12334, March 7, 2001 Michigan Public Service Commission, see pages 5, 15.

[14] See http://www.wolverinepipeline.net/wol122404.pdf.

the capacity of the former UDS pipeline into central Michigan as 50,000 barrels, which equals the capacity of the Alma refinery.[15] (And, our results suggest that gasoline prices in Lansing fell after the acquisition.) It is also difficult to isolate the possible effect of UDS's closure of its Alma refinery. Because the closure of the Alma refinery shortly preceded MAP's acquisition of UDS's other Michigan assets, there is not a significant time period during which we can observe one effect but not the other. In addition, the effect of reduced supply at Lansing and Bay City could spill over into cities such as Flint and Grand Rapids. Thus, the same cities that are affected by the change in market structure in terminal services might also be affected by the closure of the Alma Refinery. If the closure of the Alma Refinery reduced the supply of refined products into central Michigan, failing to control for it would tend to bias our results toward finding a price increase from this acquisition.

Several other supply shocks are easier to isolate. On June 7, 2000, the Wolverine Pipeline ruptured outside of Jackson, Michigan. As a consequence, no refined products were shipped on the Wolverine Pipeline between Jackson and Detroit from June 7 to June 16. After June 16, the Wolverine Pipeline operated at a reduced capacity until the end of August. The rupture of the Wolverine Pipeline caused a shortage of gasoline in eastern Michigan, which caused gasoline prices to rise to over $2 per gallon. The effects of this shortage spilled over into neighboring areas as purchasers of refined products sought to secure supplies. By the end of August, the effects of the Wolverine Pipeline rupture had largely passed. To control for this supply shock, we use a dummy variable for the period from June 7th until the end of August.[16,17]

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[15] See http://www.wolverinepipeline.net/

[16] For accounts of the Wolverine Pipeline Rupture see "Ruptured gas line should be fixed by Thursday" Associated Press, June 14, 2000; "Gasoline pipeline is shut down again for repairs" Associated Press, August 16, 2000; "Pain at the pump: Gas crisis that put drivers over a barrel shows weaknesses in U.S. fuel lifeline." Alejandro Bodipo-Memba, Free Press Business Writer, October 16, 2000; and Bulow, Jeremy, Jeffrey Fischer, Jay Creswell, and Christopher Taylor, "U.S. Midwest Gasoline Pricing and the Spring 2000 Price Spike," The Energy Journal, 2003, 24(3) pp. 121-149.

[17] A search of the Department of Transportation's Office of Pipeline Safety website found only one other pipeline incident that might have differentially affected our treatment cities and control cities. We searched trade press sources and examined the pricing data and found no

Between early May and late July of 2000, the price of gasoline in the Chicago and Milwaukee areas increased relative to the rest of the country. This price increase (hereafter, the Midwest gas price spike) was primarily caused by supply disruptions relating to the introduction of a new formulation of reformulated gasoline in Chicago and Milwaukee (see Bulow et al. 2003). While the price increase was greatest for reformulated gasoline sold in Chicago and Milwaukee, the price of conventional gasoline also increased. We include a dummy variable to control for any differential effects that this Midwest gas price spike had on prices in the cities we examine. To allow the effects of the Midwest gas spike and the Wolverine outage to be different, this dummy variable goes to zero when the Wolverine outage begins.

In August of 2001, Citgo's Lemont (Chicago) refinery experienced a fire which reduced its output for six months. However, increased shipments from the Gulf returned the price differential between the upper Midwest and the Gulf to normal after approximately two months. To control for any differential effects that this refinery outage had on prices in the cities we examine, we include a dummy variable for the two-month period when this refinery outage appeared to affect prices.

Several terminals closed or changed ownership within several years of the acquisition. These changes in terminal ownership probably had little effect on competition in the cities that we study with two possible exceptions. Depending on the geographic scope of the relevant terminal markets, Uno-Ven's shutdown of its terminal in Bay City between 1997 and 1999 and Equilon's purchase of the Clark Oil terminal in Marshall sometime between 1999 and 2001 may have affected price. We cannot control for these changes, however, because we are unable to get approximate dates for when they occurred. Failing to control for these changes would tend to bias our results toward finding a price increase from this acquisition.

We initially included several dummy variables in our regression to account for other possible supply and demand shocks. We later deleted these dummy variables since their coefficients were small and rarely statistically significant and their exclusion did not affect our other results. These dummy variables included monthly dummy variables to allow for systematic differences in seasonal prices between our treatment cities and control cities, a

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indication that this disruption had any significant effect.

dummy variable to account for a 2001 fire at Tosco's refinery in Wood River, IL, a dummy variable accounting for the Federal Energy Regulatory Commission's (FERC) September 2001 decision to allow Wolverine to set market-based rates for pipeline transport to Chicago, Elkhart, and Toledo, and a dummy variable accounting for FERC's July 2001 decision to allow Wolverine to set market-based rates for pipeline transport to Detroit and Wolverine's concomitant agreement to facilitate third-party refined products shipments to Grand Rapids (see FERC Docket No. OR99-15).

Data

To study gasoline prices in the six treatment and two control cities, we use a dataset drawn from data on retail gasoline prices compiled by the Oil Price Information Service (OPIS). The OPIS data is based on transactions in which someone uses a fleet card to purchase gasoline from a gasoline station.[18] While this data is among the best available, we only observe the price for a specific station if someone used a fleet card to purchase gasoline at that station. Hence gasoline stations that do not accept fleet cards are not sampled. Because the stations that do not accept fleet cards tend to sell unbranded gasoline and unbranded retailers generally charge lower prices than branded retailers, the OPIS data will tend to overestimate the actual retail gasoline prices in an area. We do not believe that this affects the results in this paper, however, since any changes over time in this overestimate will likely affect our treatment and control cities equally.

The fact that OPIS records a price only if someone uses a fleet card to purchase gasoline also means that the set of stations reporting price data to OPIS varies from day to day. As a consequence, the prices reported by OPIS are more volatile than the actual underlying prices. To reduce this volatility, we define an observation as the average of the daily prices reported over the course of a week. We focus on the pricing of regular gasoline in this study because approximately 80 percent of the gasoline sold in the U.S. is regular octane gasoline. Following similar studies that use the event study methodology, we focus on a time period long enough to allow the acquirer to take advantage of any increased market power or efficiencies

[18] A fleet card is basically a credit card that a company issues to some of its employees (salesmen, insurance claims adjusters) to pay for gasoline and possibly repairs.

resulting from the acquisition but short enough that changes in market conditions unrelated to the acquisition do not swamp the effects of the acquisition. For this reason, we analyze a window beginning three years prior to the acquisition and ending three years after the acquisition.[19]

IV. Results

To obtain a rough estimate of the effect of this acquisition, we plot the price of gasoline in the treatment cities relative to the control cities. Figure 3 shows the 12-week moving average of the price of gasoline in Lansing and in Flint relative to South Bend.[20] The graph suggests that, apart from the price spike resulting from the rupture of the Wolverine Pipeline in the summer of 2000, the relative price in Flint did not change and the relative price in Lansing decreased. The graphs for pairings of other treatment cities with the two control cities look similar to the results for Flint.

We next estimate the relationships between the treatment cities and the control cities using the simple difference-in-differences estimator discussed in the methodology section. For the twelve pairings of treatment city and control city, Table 3 presents the estimated coefficients and the standard errors for the merger dummy variable.[21] The estimated coefficient is less than 1.2 cents per gallon in all of the pairings and is negative in four of the pairings. In no pairing is the estimated coefficient positive and statistically significant from zero at the five percent level. The estimated coefficient is negative and statistically significant in both pairings where Lansing is the treatment city. This result suggests that Lansing area consumers may have benefitted from

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[19] Using a dummy variable to control for the period between the acquisition's announcement and consummation has little effect on our results. Using the acquisition's announcement date as the starting point for the post-acquisition period has little effect on our results. Examining a time period beginning two years before and ending two years after the transaction did not affect the results.

[20] Because it moderates the volatility of short-term price swings, the 12-week moving average provides a cleaner comparison of pre- and post- acquisition prices than does the raw price data.

[21] The standard errors in a conventional difference-in-differences estimation may be biased downward (Bertrand et al (2004)). Since in this case most of the point estimates are not statistically different from zero, it is less of a concern.

Wolverine's integration of the former UDS pipeline into its existing pipeline system.

Table 4 shows the full regression results for the six treatment cities relative to South Bend. (The results using Elkhart-Goshen as a control are similar to the results using South Bend as a control.) The June 2000 rupture of the Wolverine Pipeline meant that refined products from the Chicago area could not reach terminals located in Detroit, Lansing, and Bay City through the Wolverine Pipeline. Obviously, we would expect that gasoline prices in these cities would rise relative to the control cities. Gasoline jobbers responded to higher prices in these cities by using the nearest terminals that still could receive refined products. Thus, we would also expect that gasoline prices in cities such as Jackson and Grand Rapids would increase. Our results show this. The dummy variable for the Wolverine Pipeline rupture accounts for the average increase in price in the treatment cities relative to the control cities from June 7 to August 31, which captures the period when Wolverine Pipeline shipments were disrupted.[22] The estimated coefficient for this dummy variable ranges from roughly zero to roughly five and one-half cents. The estimated coefficient is statistically significant at the 5 percent level in most of the pairs of treatment cities and control cities.

The coefficient for the dummy variable for the supply disruption relating to the introduction of phase II reformulated gasoline in Chicago and Milwaukee is positive but not statistically significant. The coefficient for the Citgo Lemont refinery outage is negative in four of the pairings. In one pairing it is negative and statistically different from zero.

Table 5 shows the estimated merger effects for the twelve pairings of treatment city and control city when we do not control for supply shocks. In some cases the results differ significantly: The estimated price decreases in Lansing relative to Elkhart-Goshen and South Bend decline in magnitude and statistical significance; estimated price increases in Jackson relative to Elkhart-Goshen and in Kalamazoo relative to Elkhart-Goshen increase in magnitude and become statistically significant at the 5 percent level. This suggests that failing to account for supply shocks affects the results.

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[22] This period includes an unanticipated 10-day period and an anticipated 7-day period when no shipments were made on Wolverine. During the rest of this period, Wolverine operated at about 80 percent of capacity. (See "Gasoline pipeline is shut down again for repairs, Associated Press, August 16, 2000 at www.detnews.com/2000.metro/0008/16/-106455.htm)

In a previous study, the GAO (2004) found that MAP's acquisition of UDS's Michigan assets led to a statistically-significant price increase of 1.4 to 2.6 cents per gallon. There are several possible explanations for the difference between our results and the GAO's results. Our study explicitly accounts for three supply shocks that differentially affected prices in the treatment cities and the control cities whereas the GAO study only accounts for the Midwest gas price spike. Our study also examines prices for three years after the merger while the GAO study only examines prices for one year after the merger. Finally, in our study we examined retail prices while the GAO examined wholesale rack prices. Because wholesale rack prices measure the wholesale price paid by only a fraction of gasoline retailers, observing an increase in wholesale rack prices is not sufficient to infer an increase in retail prices.[23]

IV. Conclusion

The above results suggest that MAP's acquisition of UDS's Michigan wholesale and retail assets had very little effect, positive or negative, on retail gasoline prices in Michigan. This result is robust to changes in the length of time studied and changes in the starting date of the post-merger period. Since we would be unlikely to see these results if MAP's acquisition of UDS substantially lessened competition, we believe that these results provide some support for the view that gasoline mergers with pre-merger and post-merger wholesale and retail concentration levels similar to those in this case study do not substantially harm competition.

MAP's acquisition of UDS's Michigan assets had little direct effect on the refining and pipeline sectors of the oil industry. Thus, this study is silent about what types of refinery or pipeline mergers might harm consumers with one exception: The observation that gasoline prices in Lansing fell relative to gasoline prices in the control cities suggests that consumers may have benefitted from Wolverine's integration of the former UDS pipeline into its existing pipeline system.

[23] Taylor and Hosken(2004) examine a case where an increase in rack prices was not fully passed through to retail prices.

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Table 1 - Terminal Capacity and Market Share in Michigan					
Terminal	City	Supply Source	Capacity	Share	Firm Share
Amoco Oil Company	Cheboygan	barge, tanker	150,000	1.5%	
Amoco Oil Company	Napoleon	Pipeline, Truck	250,000	2.5%	
Amoco Oil Company	River Rouge	Buckeye, Amoco	803,000	7.9%	
Amoco Oil Company	Taylor	Wolverine, Amoco	248,000	2.4%	14.3%
Citgo Petroleum	Ferrysburg	Wolverine Pipeline	180,722	1.8%	
Citgo Petroleum	Jackson	Wolverine Pipeline	222,700	2.2%	
Citgo Petroleum	Niles	Wolverine Pipeline	270,688	2.7%	
Citgo Petroleum	Romulus	Wolverine, Sun	175,000	1.7%	8.4%
Clark Refining & Marketing	Marshall	Wolverine Pipeline	281,000	2.8%	
Clark Refining & Marketing	Taylor	Buckeye, Wolverine	311,000	3.1%	5.8%
Equilon Enterprises LLC	Detroit	Buckeye, Wolverine	608,000	6.0%	
Equilon Enterprises LLC	Ferrysburg	Wolverine Pipeline	306,000	3.0%	
Equilon Enterprises LLC	Jackson	Wolverine Pipeline	81,100	0.8%	
Equilon Enterprises LLC	Niles	Wolverine Pipeline	416,900	4.1%	
Equilon Enterprises LLC	Romulus	Wolverine, Buckeye, Equilon	353,000	3.5%	17.4%
Marathon Ashland Petroleum	Detroit	truck	100,000	1.0%	
Marathon Ashland Petroleum	Jackson	Wolverine Pipeline	280,000	2.8%	
Marathon Ashland Petroleum	Mount Morris	Buckeye	237,000	2.3%	
Marathon Ashland Petroleum	Niles	Wolverine Pipeline	332,000	3.3%	
Marathon Ashland Petroleum	N. Muskegon	MAP	455,000	4.5%	
Marathon Ashland Petroleum	Taylor	Buckeye, Sun, Wolverine	229,000	2.3%	16.1%
Mobil Oil Corporation	Flint	Buckeye	191,000	1.9%	
Mobil Oil Corporation	Niles	Wolverine Pipeline	117,300	1.2%	
Mobil Oil Corporation	Woodhaven	Wolverine, Buckeye	1,198,300	11.8%	14.9%
Sun Refining Company	Detroit	Sun Pipeline	176,000	1.7%	
Sun Refining Company	Owosso	Buckeye	230,000	2.3%	4.0%
UDS	Bay City	UDS Pipeline	400,000	4.0%	
UDS	Lansing	UDS Pipeline	400,000	4.0%	
UDS	Traverse City	Tanker, Transport Truck	150,000	1.5%	9.4%
Atlas Oil	Taylor	Wolverine, Buckeye, Sun	273,000	2.7%	
BP Oil Company	Taylor	Buckeye	264,000	2.6%	
Cousins Petroleum	Taylor	Buckeye, Wolverine	190,000	1.9%	
Michigan Marine Terminal	River Rouge	Buckeye, Wolverine	216,000	2.1%	
Waterfront Petroleum Terminal	Dearborn	pipeline barge	30,000	0.3%	

Source: 1997, 1999, and 2001 Petroleum Terminal Encyclopedia, Oil Price Information Service

Because the Petroleum Terminal Encyclopedia did not report capacity figures for some terminals, some capacity figures are estimated. Equilon's Romulus terminal is assigned the average capacity of the Detroit area terminals. MAP's Detroit terminal is given a small capacity because it is supplied by truck. The UDS terminal at Traverse City and Amoco's terminal at Cheboygan are given a small capacity because they are distant from large population centers. The UDS terminals at Lansing and Bay City distributed refined products from the Alma refinery, which produced about 10 percent of Michigan's needs. These terminals were assigned a capacity slightly below 10 percent of the terminal capacity in Michigan. The Amoco refinery at Napoleon was assigned a capacity roughly consistent with similar terminals.

Table 2 - Market Share by Brand						
Brand	Flint	Lansing	Saginaw-Bay City	Grand Rapids-Muskegon	Jackson	Kalamazoo-Battle Creek
Marathon Ashland Petroleum	23%	17%	9%	10%	5%	10%
Speedway-SuperAmerica	12%	13%	6%	8%	3%	8%
Marathon	11%	4%	3%	2%	2%	2%
UDS (Total)	7%	13%	10%	2%	8%	7%
BP-Amoco	4%	4%	6%	11%	3%	6%
Equilon (Shell-Texaco)	3%	7%	3%	10%	8%	16%
Citgo	3%	1%	1%	1%	0%	3%
Clark Refining & Marketing	6%	7%	13%	5%	10%	14%
Mobil	2%	8%	2%	9%	3%	3%
Sunoco	19%	1%	6%	2%	0%	0%
Others	32%	43%	50%	50%	64%	42%
MAP/UDS Share	30%	30%	19%	12%	13%	17%
Total Number of Stations	94	119	105	249	39	117

Table 3 - Estimated Merger Effects(Full Specification)						
Control City	**Flint**	**Lansing**	**Saginaw-Bay City**	**Grand Rapids-Muskegon**	**Jackson**	**Kalamazoo-Battle Creek**
Elkhart-Goshen, IN	0.10	***-1.44***	0.66	0.39	1.15	1.06
	(0.63)	***(0.67)***	(0.64)	(0.62)	(0.72)	(0.61)
South Bend, IN	-0.43	***-1.96***	0.13	-0.13	1.01	0.54
	(0.63)	***(0.65)***	(0.62)	(0.61)	(0.74)	(0.61)

Standard errors in parentheses
Significant estimates in bold

Table 4 Individual City Regressions (Control South Bend, In)						
Variable	**Flint**	**Lansing**	**Saginaw-Bay City**	**Grand Rapids-Muskegon**	**Jackson**	**Kalamazoo-Battle Creek**
Merger	-0.43	-1.96	0.13	0.13	1.01	0.54
	(0.63)	(0.65)	(0.62)	(0.61)	(0.74)	(0.61)
Midwest Gas	0.20	1.50	0.89	1.07	-0.32	1.12
	(2.13)	(2.09)	(2.07)	(1.83)	(2.48)	(1.89)
Wolverine Rupture	***3.72***	***5.70***	2.03	***4.38***	***4.57***	***2.89***
	(1.21)	***(1.24)***	(1.19)	***(1.15)***	***(1.42)***	***(1.16)***
Lemont Outage	-0.54	***-2.99***	1.42	-0.63	-1.63	0.09
	(1.54)	***(1.55)***	(1.51)	(1.40)	(1.81)	(1.43)
Constant	***1.88***	***2.90***	***1.63***	***2.30***	***1.22***	***1.84***
	(0.43)	***(0.45)***	***(0.43)***	***(0.42)***	***(0.51)***	***(0.43)***
rho	0.48	0.52	0.49	0.56	0.49	0.55

Standard errors in parentheses.
Significant estimates in bold

Table 5 - Estimated Merger Effects (No Supply Shocks)						
Control City	**Flint**	**Lansing**	**Saginaw-Bay City**	**Grand Rapids-Muskegon**	**Jackson**	**Kalamazoo-Battle Creek**
Elkhart-Goshen, IN	0.45	-0.96	0.93	0.84	***1.91***	***1.37***
	(0.63)	(0.77)	(0.61)	(0.67)	***(0.73)***	***(0.60)***
South Bend, IN	-0.02	-1.44	0.46	0.36	1.43	0.89
	(0.64)	(0.77)	(0.61)	(0.69)	(0.76)	(0.63)

Standard errors in parentheses.
Significant estimates in bold.

Figure 1:
Michigan Product pipelines - 2000

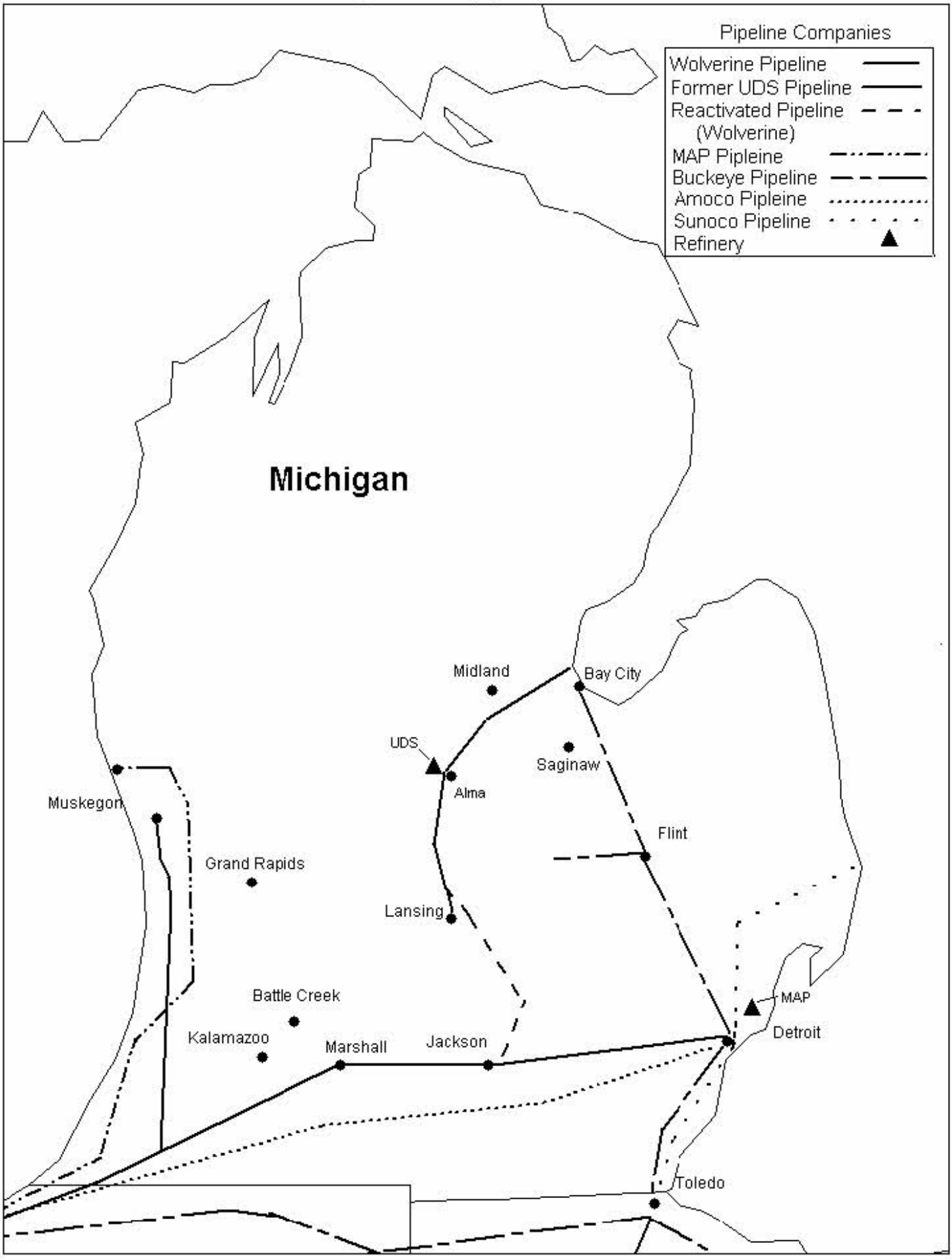

Figure: 2
Refined Product Terminals in 1999

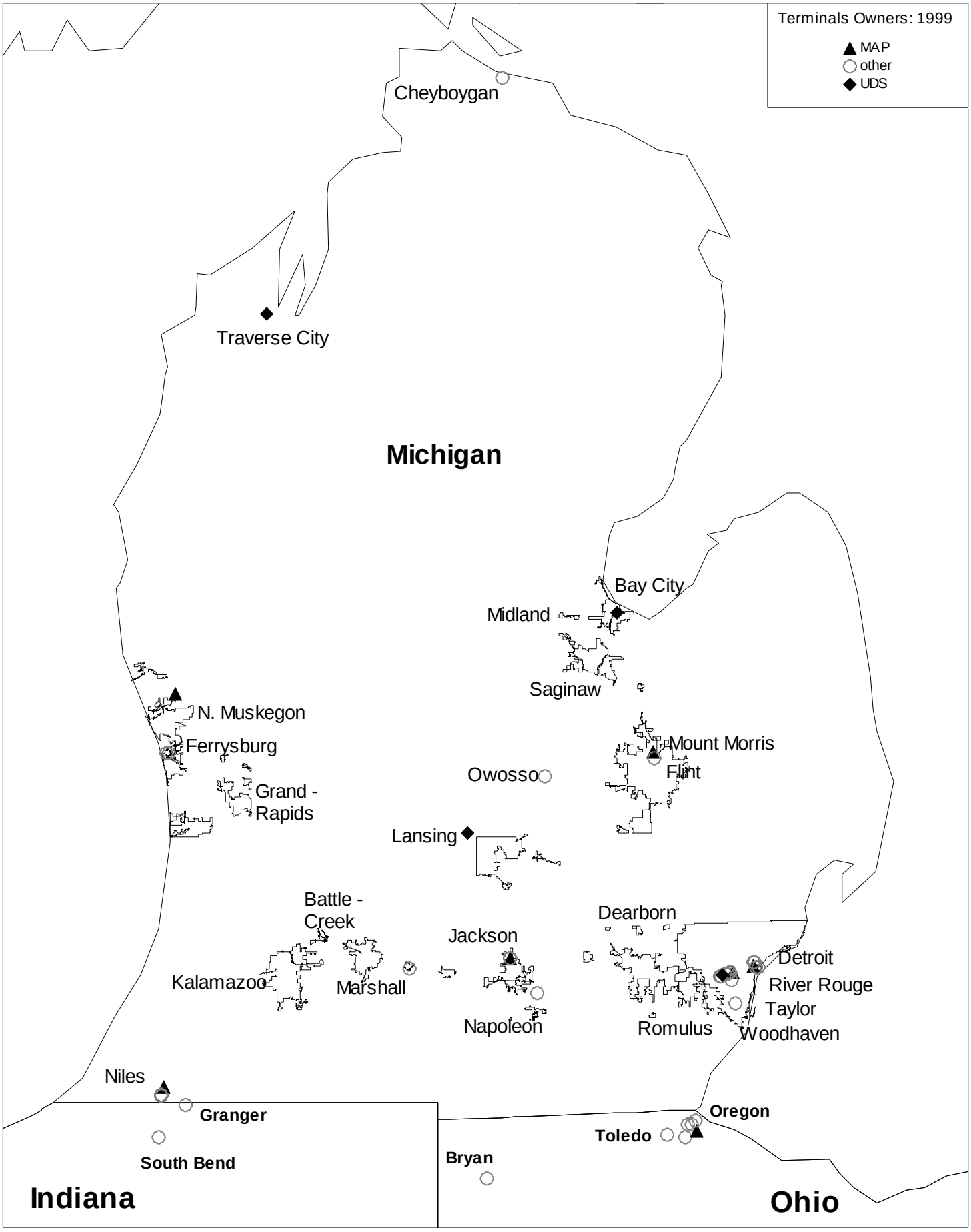

Figure 3
The Retail Price of Gasoline in Lansing and Flint Relative to South Bend (no tax)