

ASSESSING THE IMPACT OF MONOPOLY TOLL ROAD SERVICE AREAS

John A. Spry

University of St. Thomas

and

Jocelyn Elise Crowley

Rutgers, The State University of New Jersey

INTRODUCTION

In recent years, debates surrounding the merits of privatization of traditionally government-provided services have grown in intensity. Privatization is based on the free market theory that increased competition lowers the cost of goods and services [Goldsmith, 1999; Henig, 1989]. Supporters of outsourcing argue that goods and services are provided at higher quality and lower cost when private companies rather than the government are engaged in market transactions [Savas, 2000; Stein, 1990]. Skeptics, alternatively, maintain that outsourcing both increases costs and rewards politically connected corporations with lucrative government contracts [Cassell, 2000].

These debates, however, have frequently missed the subtleties involved in the central component of current privatization schemes, namely, the *degree* of privatization that should take place [Vickers and Yarrow, 1991; Warner and Hebdon, 2001]. More generally, privatization can consist of a whole range of free market approaches to the provision of goods and services. At one extreme, governmental lawmakers can decide simply to withdraw from a certain area of business, such as trash collection. Much more common, however, are intermediate privatization schemes, such as outsourcing or contracting, where governmental officials still retain a substantial amount of control over goods and service production by deciding who the key private players will be. Here the debates surrounding privatization become much more nuanced. How should contracts be awarded? Should the government grant multiple firms contracts and the right to compete against one another in the same market, or should one firm be able to win exclusive operating rights—similar to monopoly rights—in a given business area?

The social losses and inefficiencies due to rent-seeking contests to secure monopoly positions are theoretically well known but deserve additional empirical examination [Demsetz, 1968; Posner, 1975]. This paper examines the effects of legal monopolies created when state governments, through their toll road authorities, grant exclusive operating rights to gasoline and food service providers.¹ Toll road service

John A. Spry: University of St. Thomas, mail #TMH 343, 1000 LaSalle Avenue, Minneapolis, MN 55403-2005. E-mail: jaspry@stthomas.edu

areas are an ideal setting to explore real-world issues about contracting out empirically because the pricing behavior of competitive versus monopoly firms can be directly compared.² Indeed, it is rare to be able to cleanly analyze the different behavior of monopoly and competitive firms simultaneously using observations from both market structures in close geographical proximity. For example, direct comparison of the behavior of private and public schools is hampered by sorting and peer effects [Zimmer and Toma, 2000; Rivkin, 2001; Hoxby, 2000]. In the case of toll road service areas, however, standardized products and brands are available from a vigorous competitive market along nearby non-toll roads, where there is free entry into the economic marketplace. The behavior of these competitive firms, therefore, can be directly contrasted with that exhibited by firms on the toll roads.

What are the consequences of these exclusive contracts on the motoring public? We begin by building a spatial model of pricing at toll road service areas. We follow this with a discussion of the major features of toll road service contracts in the state we are examining, New Jersey. We then present contractual and limited survey evidence that prices for gasoline and food are higher along the toll roads than at comparable businesses off the toll roads. The next two sections estimate the elasticity of demand for gasoline and food at service areas along toll roads and the social welfare effects of higher gasoline and food prices at toll road service areas. The final section offers some conclusions.

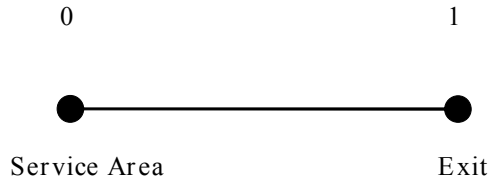
A SPATIAL MODEL OF PRICING AT TOLL ROAD SERVICE AREAS

Beginning with Hotelling's [1929] seminal contribution, the spatial pricing literature has considered the effects of transportation costs, or product differentiation, on firms' pricing decisions [Tirole, 1993]. Toll road service areas are able to charge noncompetitive prices because of the combination of the legal barriers to entry of competitors along the toll road and the transportation costs consumers face to buy goods off the toll road.³ We examine the pricing decisions of firms with exclusive operating rights at toll road service areas in a modified Hotelling model.

Consider a line with length normalized to one. Figure 1 shows that there is a service area at the origin, as well as an exit at the right end of the line. Consumers are uniformly distributed along this unit interval with density 1. Transportation costs for a consumer to travel to the service area or exit to make a purchase is t per unit of distance. With linear transportation costs, a consumer at location x incurs a cost of tx to go to the service area and $t(1 - x)$ to go to the exit. This transportation calculation reflects the opportunity cost of the consumer's time to travel to the location selling the good.

Consumers have unit demands. A consumer receives utility s from buying the good. Let p_1 be the price of the good at the service area and p_2 be the price of the good at the exit. For a consumer at location x , consumer surplus is $s - p_1 - tx$ if the purchase is from the service area, and $s - p_2 - t(1 - x)$ if the purchase is at the exit. Let \bar{x} be the location of a consumer who is just indifferent between purchases at the two locations. The cost of buying from either location must be equal for this consumer such that $p_1 + t\bar{x} = p_2 + t(1 - \bar{x})$. Therefore, $\bar{x}(p_1, p_2) = (p_2 - p_1 - t) / 2t$ is the location of the indifferent consumer.

FIGURE 1
The Linear Model



The demand curve facing the firm at the service area is

$$(1) \quad D_1(p_1, p_2) = (p_2 - p_1 - t) / 2t$$

and the demand curve facing firms at the exit is

$$(2) \quad (p_1 - p_2 + t) / 2t$$

There is free entry and exit at the right end of Figure 1. The unit cost of producing the good for each store is c . The price at the exit equals marginal cost, $p_2 = c$, because of free entry and exit. The toll road’s legal barrier to entry results in a single firm being located at the service area at the left end of Figure 1.

The profits of the firm at the service area are as follows:

$$(3) \quad \pi_1(p_1, p_2) = (p_1 - c) * d_1(p_1, p_2) = [(p_1 - c)][(p_2 - p_1 + t) / 2t]$$

Taking the partial derivative with respect to the price at the service area, the first order condition is $p_2 - 2p_1 + t + c = 0$. The price charged by the firm at the service area is: $p_1 = c + (t/2)$. Per-unit profits for the firm at the service area are $t/2$. In equilibrium, consumers to the left of location $1/4$ buy from the toll road service area, and consumers to the right buy at the exit. The monopoly profits of the firm at the toll road service area are $t/8$.

Simple comparative statics from this model provide us with predictions about three critical ways toll road authorities and firms should behave under this market structure. First, the price markup is directly related to transportation costs. Increasing transportation costs also increases the value of the toll road monopoly as directly shown by the profit function. Toll road service providers therefore have a motivation to reduce information about alternatives. In fact, in the State of New Jersey, signs along the toll roads that provide information about services offered off the toll roads are expressly prohibited.⁴

Second, Posner [1975] argued that rent seeking to control the monopoly profits will create additional social waste, beyond the standard monopoly deadweight loss “triangle”. The Posner argument is that a firm would be willing to expend almost all

of the monopoly rents to become the monopoly. Therefore, a firm would be willing to pay up to $t/8$ for the right to become the monopoly. A lump-sum payment of $t/8$ could be paid to the authority for exclusive operating rights. Even if the government authority allocated the right to be a monopoly by directly accepting payments, however, the rent-seeking competition would be to control the toll road authority. The monopoly rents are social waste, because directly unproductive activities will be undertaken to obtain control of the toll road authority that receives royalty payments.

Third, even if these toll road service operators are structured such that they have monopoly powers, an opportunity for regulation still exists through price caps. Governmental officials often face difficulties when regulating monopolies because they are unfamiliar with the demand and marginal cost curves facing the single producers of goods and services [Laffont and Tirole, 1986]. Since gasoline and fast food are very standardized goods, however, if there ever were a case where price caps could work, it would be here. Nevertheless, as we will demonstrate in the next two sections, even though the toll road authorities might specify such price caps in their contractual agreements with their service providers, they have no incentive to enforce these ceilings.

CONTRACTS BETWEEN TOLL ROAD AUTHORITIES AND SERVICE PROVIDERS

Toll road authorities contract with vendors to provide food and gasoline services for motorists at rest stops along toll roads. Contracts between toll road authorities and service providers typically extend over multi-year time periods and grant the businesses that obtain these contracts exclusive operating rights at service areas. We examine contracts between the following New Jersey toll road authorities and their food and gasoline service providers: the New Jersey Turnpike (NJT), the Garden State Parkway (GSP), and the Atlantic City Expressway (ACE). Table 1 lists the service areas on each of these toll roads and the companies that hold the exclusive operating rights for each service area.

Several features are common to all of the contracts we examined. First, toll road authorities grant exclusive gas and food operating rights at a service area to *one* firm; all other firms are prohibited from serving motorists. In other words, one contract grants exclusive rights to sell gasoline and another grants the exclusive rights to operate food courts. For example, the NJT has granted exclusive operating rights for Turnpike restaurants at service areas to HMS Host through 2018 [*Operating Agreement for Turnpike Restaurants Between The New Jersey Turnpike Commission and HMS Toll Roads, Inc.*, 2000]. Sunoco (Sun Company) has the exclusive right to sell gasoline at service areas along the NJT until 2002. Sunoco also has an option to renew this contract for an additional five years [*Gasoline Operator Agreement Between New Jersey Turnpike Authority and Sun Company, Inc.*, 1992]. Similarly, the GSP has awarded the exclusive rights to sell food services at six service areas to HMS Host until 2020, and to McDonald's at two service areas until 2021. Tosco, operating under the Mobil brand name, has the exclusive right to operate gasoline stations on the GSP. Finally, HMS Host has the exclusive right to sell food services on the ACE,

TABLE 1
Toll Road Service Areas and Service Providers in New Jersey

Service Area	Milepost	Food Contract	Gas Contract
<u>Garden State Parkway</u>			
Ocean View	18.3	HMS Host	Tosco(Mobil)
Atlantic City	41.4	HMS Host	Tosco(Mobil)
Forked River	76	HMS Host	Tosco(Mobil)
Monmouth	100	HMS Host	Tosco(Mobil)
Cheesequake	123	HMS Host	Tosco(Mobil)
Vaux Hall	142	McDonald's	Tosco(Mobil)
Brookdale North	153.3	No restaurant	Tosco(Mobil)
Brookdale South	153.3	McDonald's	Tosco(Mobil)
Montvale	171	HMSHost	Tosco(Mobil)
<u>New Jersey Turnpike</u>			
John Fenwick	5.4	HMS Host	Sunoco
Clara Barton	5.4	HMS Host	Sunoco
Walt Whitman	30.2	HMS Host	Sunoco
James Fenimore Cooper	39.4	HMS Host	Sunoco
Richard Stockton	58.7	HMS Host	Sunoco
Woodrow Wilson	58.7	HMS Host	Sunoco
Molly Pitcher	71.7	HMS Host	Sunoco
Joyce Kilmer	78.7	HMS Host	Sunoco
Thomas Edison	92.9	HMS Host	Sunoco
Grover Cleveland	92.9	HMS Host	Sunoco
Vince Lombardi	111.6	HMS Host	Sunoco
Alexander Hamilton	111.6	HMS Host	Sunoco
<u>Atlantic City Expressway</u>			
Intercept Parking Lot	4	HMS Host	Sunoco
Farley	21.5	HMS Host	Sunoco

while Sunoco has exclusive operating rights to sell gas on the same roadway until 2014.

Secondly, often several brands of food are available within each service plaza. More specifically, inside the service areas frequently several separate retail establishments offer different products. While different brands are offered at service areas, all brands are provided through a contract with only one service provider per service area for food or gasoline. New Jersey law concerning toll roads requires “that a sufficient number of gas stations may be authorized to be established in each service area along any such highway to permit reasonable competition by private business in the public interest”[N.J.S.A. 27:23-9]. Although this clause has not been interpreted in a court decision, toll road authorities have chosen to have each of these brands or concepts be operated by the same firm, instead of having different firms compete, each selling food under its own brand name.

Third, these contracts are not awarded through competitive bidding. While the highway authorities may have issued the first contracts competitively, renewals instead are often subject to informal renegotiations. For example, there was no com-

TABLE 2
Price Formulas and Limitations for Fuel Operators Along
New Jersey's Toll Roads

	Garden State Parkway (GSP)	Atlantic City Expressway (ACE)	New Jersey Turnpike (NJT)
Fuel	Mobil, Inc.	Sunoco, Inc.	Sunoco, Inc.
Formula	–Cents per gallon markup over the average prices at a group of service stations located within 2 miles of the GSP –Determined by joint survey of the agreed upon stations	–Cents per gallon markup over prices at gas stations on the NJT and GPS as determined by surveys conducted by Sunoco	–Cents per gallon markup over average prices at selected off-NJT service stations in nine survey areas
Limit	–2 cents per gallon more than the average price charged by the non-GSP stations	–2 cents more per gallon than the average price charged on the NJT and GSP	–The contract does not specify a particular cents per gallon markup but does include a sample table that shows a 1 to 2 cent markup depending on the grade of fuel [p.37]

Agreement Between the New Jersey Highway Authority and Mobil Oil Corporation, 1995; Gasoline Operator Agreement Between the New Jersey Turnpike Authority and Sun Company, Inc., 1992; Agreement Between the South Jersey Transportation Authority and Sunoco, Inc., 1998.

petitive bidding for the extension of the HMS Host contracts for the NJT or GSP, which were renegotiated in 2000 and 2001, respectively. Instead, HMS Host negotiated with the relevant authorities for renewal purposes.⁵ Notably, this informal policy of renegotiation has been successfully legally challenged in the related toll road business of towing contracts, but not as of yet with respect to food and gasoline provision.⁶

Fourth, most toll roads have royalty payment schedules that provide a steady revenue stream based on their service providers' gross sales. Typically the royalty schedule is calculated differently for gas and food. For example, the NJT receives a payment from Sunoco for each gallon of gas the company sells. The royalty schedule for food is slightly more complicated. HMS Host guarantees at least \$3,050,000 to the Turnpike Authority [*Operating Agreement for Turnpike Restaurants Between The New Jersey Turnpike Commission and HMS Toll Roads, Inc., 2000, 97*]. Beyond this minimum, as HMS Host generates more revenue from its food services, the Turnpike Authority collects a higher percentage of sales as royalties. For example, if HMS Host produces up to approximately \$34 million in sales, the Turnpike Authority is guaranteed a 14 percent royalty; if, during another year, HMS Host generates \$65 million in sales, the Turnpike earns a 17 percent royalty [*Operating Agreement for Turnpike Restaurants Between The New Jersey Turnpike Commission and HMS Toll Roads, Inc., 2000, 98*].

TABLE 3
Price Formulas and Limitations for Food Operators Along
New Jersey’s Toll Roads

	Garden State Parkway (GSP)	Garden State Parkway (GSP)	Atlantic City Expressway (ACE)	New Jersey Turnpike(NJT)
Food	McDonald's	HMS Host Tollroads, Inc. (Burger King)	Marriott (Roy Rogers)	HMS Host Corp. (Roy Rogers)
Formula	Not Reported	Prices at the company's own restaurants in NJ not located on the GSP	Prices charged shall be reasonably suited to the traveling public at large and shall be in keeping with prices charged for comparable food and service sold on toll highways in the general vicinity of the ACE	Prices at the operator's off-NJT, like-restaurants operating under the same trade names in the state of NJ, excluding those on the GSP
Limit	No specific, numerical limit found	Cannot charge prices in excess of 110 percent of the prices it charges at its freestanding restaurants in NJ	No specific, numerical limit found	Prices charged will not exceed by more than 10 percent the prices charged by operator's off-NJT, like-restaurants operating under the same trade names in the state of NJ

Operating Agreement for Turnpike Restaurants Between The New Jersey Turnpike Commission and HMS Toll Roads, Inc., 2000; Agreement Between the New Jersey Highway Authority and HMSHost TollRoads, Inc., 2001; Agreement Between the New Jersey Highway Authority and McDonalds Corporation, 1998.

PRICES ON NEW JERSEY TOLL ROADS

One prediction of standard economic theory is that prices will be higher under monopoly than under competition. The evidence supports this prediction. The New Jersey toll road authorities and service providers openly engage in “pricing strategies” to set prices at their service areas for items like gas and food to be higher than the prices of comparable goods off the toll road. Tables 2 and 3 summarize these “strategies.”

Contracts between toll road authorities and gas providers explicitly set the price per gallon at a certain amount above the price offered at comparable non-toll road stations. The Garden State Parkway has entered into an agreement with Tosco, which operates the Mobil brand stations, “that Mobil may add two (2) cents” to the average price charged by comparable service stations near the Parkway.⁷ The NJT permits Sunoco to round up to the nearest nine-tenths of a cent and then add an additional cent to the price of gasoline of nearby stations. In terms of food, toll roads in their contracts normally require that prices can be no more than a certain percentage higher

TABLE 4
New Jersey Toll Road Gasoline Prices
Average Prices

Item	Parkway	off-Parkway	Expressway	off-Expressway	Turnpike	off-Turnpike
87 Grade	\$1.68	\$1.61	\$1.65	\$1.60	\$1.63	\$1.62
89 Grade	\$1.78	\$1.73	\$1.75	\$1.70	\$1.73	\$1.72
93 Grade	\$1.86	\$1.82	\$1.82	\$1.79	\$1.80	\$1.82
Diesel	\$1.59	\$1.56	\$1.39	\$1.37	\$1.34	\$1.34

For the Garden State Parkway, data was collected from all Parkway service areas. Control data was collected from Texaco, Gulf and Amoco off Exit 17; Mobil off Exit 20; Citgo off Exit 40; Shell off Exit 74; Exxon and Citgo off Exit 100a; Shell, Sunoco, Exxon, and Hess off Exit 120; Getty off of 142a; Getty and Gulf off Exit 153a; and Getty and Exxon off Exit 172.

For the Atlantic City Expressway, data was collected from all Expressway service areas. Control data was collected from a Gulf station in Atlantic City next to the expressway, and Gulf, Amoco, and Texaco stations off Exit 17.

For the New Jersey Turnpike, data was collected from all Turnpike service areas. Control data was collected from Mobil, Pilot, and Shell stations off Exit 2; Mobil off Exit 4; Pilot and Mobil off Exit 7; Gulf off Exit 7a; Gasway and Gulf off Exit 8a; 2 Costal, Amoco, Exxon, Sunoco, Amoco, and Gulf off Exit 9; Gulf and Amoco off Exit 12; and Gulf off Exit 17.

than those charged at comparable non-toll road establishments. For example, the NJT and GSP have language in their contracts with food service providers limiting the average price of food to be no more than 10 percent higher than the average price off the toll road.

Do the toll road authorities ensure that their service providers are complying with these “pricing strategies?” To verify pricing compliance, the GSP requests weekly price data from 80 similar, non-toll gas stations and compares these prices to prices along the Parkway [*Agreement between the New Jersey Highway Authority and Mobil Oil Corporation*, 1995, 10; Interview with Mr. David Ryan, General Services Manager, Garden State Parkway, June 2001]. With respect to food, the Parkway allows a 10 percent mark-up, but does not survey similar establishments to monitor compliance [*Agreement between the New Jersey Highway Authority and the HMSHost Tollroads, Inc.*, 2001; Interview with Mr. David Ryan, General Services Manager, Garden State Parkway, June 2001]. Other toll road authorities employ private contractors to check the prices of their non-toll road competitors and some survey comparable firms themselves.

Additional evidence that legal monopolies along toll roads create higher prices comes from price data along the 9 service areas of the Garden State Parkway, the 12 service areas of the New Jersey Turnpike, and the 2 service areas of the Atlantic City Expressway collected between May 17-May 21, 2001. To gather this data, we visited each rest stop in person and recorded the gas and food prices that were posted in each open establishment (see Table 1).

To collect control or comparison data, we used the following methodological techniques. First, we located the exits closest to each rest stop and attempted to identify the same or similar establishments to those along the toll roads. We then used a

TABLE 5
New Jersey Toll Road Convenience Store Prices
Average Prices

Item	Parkway	off-Parkway	Expressway	off-Expressway	Turnpike	off-Turnpike
20 oz. Coke	\$1.45	\$1.26	\$1.49	\$1.09	\$1.19	\$1.22
20 oz. Pepsi	\$1.45	\$1.26	\$1.59	\$1.09	\$1.32	\$1.21
Candy Bar (King-size)	\$1.39	\$1.00	\$1.39	\$.99	\$1.32	\$.93

For the Garden State Parkway, soda and candy data was collected from all service areas, except for candy data from Brookdale North and South. Control data was collected from Seven-Eleven stores in Cape May, Forked River, Ocean, Old Bridge, Bloomfield, and Montvale and from Wawa in Absecon.

For the Atlantic City Expressway, all soda and candy data was collected for the Farley Service Area. Farley is the only full-service service area on the Atlantic City Expressway. Control data was collected from the Seven-Eleven in Hammonton, NJ.

For the New Jersey Turnpike, Coke data was collected from the Clara Barton, Joyce Kilmer, and Vince Lombardi Service Areas. Pepsi data was collected from the John Fenwick, Clara Barton, Richard Stockton, Woodrow Wilson, Molly Pitcher, Joyce Kilmer, and Vince Lombardi Service Areas. Candy data was collected from the Richard Stockton, Woodrow Wilson, Molly Pitcher, and Vince Lombardi Service Areas. Control data was collected from Pilot off Exit 2, Pilot off Exit 7, Seven-Eleven off Exit 9, Seven-Eleven off Exit 10, and Seven-Eleven in Lyndhurst.

“visibility test” when deciding which establishments we would enter, meaning that we only collected data from those businesses we could immediately see upon leaving the toll road exit ramp. If no establishments were visible, we then proceeded along these exit roads for up to 5 miles to locate potential control businesses.

If we still could not locate any control establishments that ran parallel to our toll road service areas, we collected data from three regions along the Turnpike and the Parkway: Northern, Central, and Southern Jersey. For each region, we located similar establishments to the ones along the toll roads using the yellow pages, and then either visited these businesses in person or made phone calls to collect the relevant price data. Whenever possible for this regional data collection, we used prices from businesses in towns where toll roads were located.

We first compared gasoline prices along the major toll roads to the average gasoline prices offered at control gasoline stations off the toll roads (see Table 4). Average gasoline prices were moderately higher on the Parkway and the Expressway than on similar non-toll roads. For example, the average price for regular, 87 grade gas on the Garden State Parkway was \$1.68 per gallon, compared with \$1.61 per gallon on the off-Parkway roads. For the same grade gas along the Expressway, consumers pay, on average, \$1.65 per gallon, compared with \$1.60 per gallon on similar off-Expressway roads. Interestingly, on average, gasoline prices on the New Jersey Turnpike did not exceed gasoline prices off the Turnpike, and were generally lower overall when compared to those on the other two toll roads.

One reason that we found gas prices to be lower at service areas along the New Jersey Turnpike than along the GSP or ACE is that NJT officials made a conscious decision in 1989 to reduce the amount that its service provider marks up gasoline

above the average price off the NJT. Before reducing its prices, Charles Schlager Jr., who was then director of new business development for the NJT, observed, "People are filling up off the Turnpike. We're taking the approach that if we lower the price, we'll get the volume up" ["Turnpike Gas Price to Drop," *The Bergen Record*, 20 December 1989]. This statement indicates that toll road authorities realize that they face a downward-sloping demand curve for their gasoline; that is, they recognize that they are monopoly price setters instead of competitive price-takers.

Next, we considered the prices for soda and candy sold in convenience stores along the Garden State Parkway, the Atlantic City Expressway, and the New Jersey Turnpike, and compared these prices with the prices set at convenience stores along similar non-toll roads (see Table 5). We found the prices to be substantially higher along the toll road than along the non-toll roads. Along the Garden State Parkway, for example, the average price for a 20 oz. Coke or a 20 oz. Pepsi was \$1.45, compared to \$1.26 off the Parkway. Candy prices were even more dramatically marked up, averaging \$1.39 on the Parkway, and \$1.00 off the Parkway.

Finally, we examined the price differentials for various meals in restaurants offered along the toll roads and along the non-toll roads (see Table 6). We first considered HMS Host's Burger King Restaurants, which hold the exclusive right to sell fast food at many service areas on the Garden State Parkway and at the Farley Service Area on the Atlantic City Expressway. Prices for all of the common menu items surveyed at Burger King are much higher on toll roads than on non-toll roads. For example, a hamburger costs \$1.19 on the Parkway and the Expressway, but only \$0.96 on the non-Parkway roads and \$0.95 on the non-Expressway roads. The price of a "Combo Meal," which consists of a sandwich, fries, and a soda, is dramatically higher on both the Parkway and the Atlantic City Expressway. On the Parkway, motorists pay, on average, \$6.59 for a Medium Combo Mean, versus \$4.58 on a non-Parkway road. On the Expressway, consumers pay \$6.59 for the same meal, versus \$4.18 on a non-Expressway road.

As described earlier, HMS Host's Roy Rogers Restaurants are the exclusive legal providers of fast food at all service areas along the New Jersey Turnpike. Turnpike prices are substantially higher than non-Turnpike prices for all of the most common items purchased by consumers. A $\frac{1}{4}$ lb. cheeseburger, for example, is marked up 9.3 percent on the Turnpike for a price of \$2.67 compared to \$2.44 off the Turnpike. The largest markup was on the soda. For instance, a medium soda costs \$1.69 on the Turnpike, compared with an average of \$1.18 off the Turnpike. When examined in their totality, consumers are clearly paying more for gas, convenience store items, and fast food along the toll roads than they would if they had exited off the toll roads.

DEMAND ELASTICITIES FACING SERVICE PROVIDERS ON TOLL ROADS

The contracts and survey estimates of the prices found on the toll roads and non-toll roads provide us with evidence that consumers are paying more for the goods they are buying while traveling, but they do not give us an indication about the total loss in consumer welfare that such monopolistic agreements create on society at large. To conduct this type of welfare economics analysis, we must construct a demand curve facing an *individual* firm for a particular good, such as gas on the Gar-

TABLE 6
New Jersey Toll Road Restaurant Prices

Item	Average Prices Toll Road	Average Prices Off-Toll Road	Mark=up	Percentage Markup
<u>Garden State Parkway and Burger King</u>				
Hamburger	\$1.19	\$.96	\$.23	23.9
Whopper	\$2.99	\$2.55	\$.44	17.4
BK Broiler	\$3.49	\$2.99	\$.50	16.7
Medium Fries	\$1.79	\$1.53	\$.26	18.2
Medium Soda	\$1.39	\$1.15	\$.24	22.2
Medium Whopper Combo	\$6.59	\$4.58	\$2.03	44.9
<u>Atlantic City Expressway and Burger King</u>				
Hamburger	\$1.19	\$.95	\$.24	25.3
Whopper	\$2.99	\$2.29	\$.70	30.6
BK Broiler	\$3.49	\$2.99	\$.50	16.7
Medium Fries	\$1.79	\$1.69	\$.10	5.9
Medium Soda	\$1.39	\$.99	\$.40	40.4
Medium Whopper Combo	\$6.59	\$4.18	\$2.41	57.7
<u>New Jersey Turnpike and Roy Rogers</u>				
¼ lb. Cheeseburger	\$2.67	\$2.44	\$.23	9.3
Roast Beef Sandwich	\$3.59	\$3.33	\$.26	7.9
Chicken Sandwich	\$3.47	\$2.96	\$.51	17.4
9 Pc. Chicken Nuggets	\$3.29	\$2.93	\$.36	12.2
Small Mashed Potatoes	\$1.19	\$1.06	\$.13	12.6
Large Mashed Potatoes	\$2.59	\$2.36	\$.23	9.6
Medium Fries	\$1.58	\$1.36	\$.21	15.7
Medium Soda	\$1.69	\$1.18	\$.51	43.6

For the Garden State Parkway, Burger King data was collected from the Cheesequake, Atlantic City, Forked River, Monmouth, and Montvale Service Areas. Control data was collected from Burger King restaurants off Exit 17, Exit 40, Exit 74, Exit 120, and Exit 171.

For the Atlantic City Expressway, Burger King data was collected from the Farley Service Area. Control data was collected from the Burger King off Exit 17 in Hammonton.

For the New Jersey Turnpike, Roy Rogers data was collected from each Service Area, with the exception of the Walt Whitman Service Area. Some restaurants did not include all menu items considered above. Control data was collected from Roy Rogers Restaurants located in Trenton, Livingston, and North Brunswick, New Jersey.

den State Parkway (the illustrative case to be used here). To construct this demand curve, we first must begin by calculating the elasticity of demand for gas.

The elasticity of demand facing a monopolist can be inferred using the Lerner Index of monopoly power. The Lerner index is simply: $LI = (P - MC)/P$, where P is the price charged by the monopoly and MC is marginal cost. When a monopoly is unconstrained by price controls or a price cap, a profit-maximizing monopolist's price markup will vary inversely with the elasticity of demand it faces such that $E_d = -1 / LI$.

We begin by inferring the elasticity of demand for gas facing a service station on the Garden State Parkway. Four gasoline stations in Colonia, New Jersey along the Garden State Parkway are privately owned and not subject to any "price strategy" as imposed by the GSP. A Texaco and an Exxon service station are on the northbound

side of the road and a Shell and an Exxon station are on the southbound side. During May 2001, both Exxon stations were closed for renovations. Therefore, the Texaco station had a monopoly position along that northbound part of the GSP, and the Shell station was the only provider of gasoline to southbound motorists on that stretch of the GSP. This unique situation, a single service station with no contractual limits on its pricing, provides an opportunity to measure the influence of market power on pricing.

We assume a constant elasticity of demand for gasoline facing a service station. We also assume that because of free entry into the gasoline service station industry outside of the toll roads, gasoline prices at our control stations are competitive. This implies that the average control price equals the marginal cost of providing gas. Given our assumptions of constant marginal cost equal to the average price of gasoline at the control stations, the elasticity of demand facing a gasoline station is the inverse of the Lerner Index: $E_d = -1/LI$.

We use data for regular gasoline because it is the type of gasoline most often sold. The average price of regular gasoline at the Texaco and Shell stations along the Garden State Parkway in Colonia was \$1.82 during the weeks of May 15 and May 22. The average price of regular gasoline at control gas stations off the GSP in the same area was \$1.65. The average price of regular gasoline at these two service stations with unconstrained market power was 10.8 percent greater than at the control stations. The Lerner Index for regular gasoline at these stations is 0.10. Therefore, the own-price elasticity of demand for regular gasoline facing a service station on the Garden State Parkway is -10.23 .

This same methodology can be used to determine the elasticity of demand for food using price data from the Garden State Parkway because the GSP does not monitor the prices of food at its service areas. The total cost of a market basket of the Burger King food items listed in Table 6 was \$17.44 on the GSP. The same goods cost only \$13.76 off the Parkway. The cost of this market basket was 26.7 percent higher on the GSP. The Lerner Index for food is 0.21. Therefore, the own-price elasticity of demand for fast food facing a restaurant on the Garden State Parkway is -4.74 .

SOCIAL WELFARE

Monopoly toll roads create two types of social welfare losses. The first is the standard deadweight loss triangle. The second source of social welfare loss is the dissipation of the monopoly profits through rent seeking.

Using data on the quantity of gasoline sold along a toll road, the difference in price between gasoline on and off the toll road, and the elasticity of demand for gasoline, we can now estimate the standard deadweight loss triangle due to monopoly pricing. We begin with the sale of gasoline along the Garden State Parkway. The average price of gasoline at service areas owned by the GSP was \$1.68, 4.3 percent higher than the \$1.61 average price at control stations along the GSP. In total, 54,691,082 gallons of gasoline were sold on the Garden State Parkway in 2000 [*Annual Report of the New Jersey Highway Authority*, 2000, 26].

The formula for a demand curve with a constant elasticity of demand is $Q = aP^{E_d}$. We know that $E_d = -10.23$. We observe an annual quantity of gasoline sold (in 2000) on the GSP to be 54,691,082 gallons, when the average price (using regular gasoline) is \$1.68. Algebra results in the following estimated demand curve for gasoline along the Garden State Parkway: $Q = 11,025,245,577 \cdot P^{-10.23}$. At the competitive price of \$1.61, this demand curve predicts that 84,607,269 gallons of gasoline would be sold on the GSP in the absence of state-granted monopoly rights to certain gasoline firms. By charging higher prices, the gasoline service stations on the GSP reduce their sales by 29,916,187 gallons of gasoline per year. This is a significant reduction in gasoline sales.⁸

Consumer surplus is the consumer's gain in welfare from buying a good at the price the consumer pays. Since the consumer is paying more for gasoline along the GSP, consumer surplus is reduced. The annual loss of consumer surplus due to the price of gasoline being seven cents higher along the GSP is

$$(4) \quad \int_{\$1.61}^{\$1.68} 11,025,245,577 \cdot P^{-10.23} dp = \$4,789,754$$

Monopoly profits are the per-unit markup multiplied by the quantity sold. The extraordinary monopoly profit from being able to sell gasoline along the GSP without facing competition along the toll road is $54,691,082 \cdot \$0.07 = \$3,828,376$. The dead-weight loss due to the gasoline service station monopoly along the GSP is \$961,164.84.

We now consider the sale of gasoline along the NJT. The average price of gasoline at service areas owned by the NJT was \$1.63, 0.6 percent higher than the \$1.62 average price at control stations along the NJT. In total, 66,395,024 gallons of gasoline were sold on the New Jersey Turnpike in 2000. The estimated demand curve for gasoline along the NJT is $Q = 9,835,914,055 \cdot P^{-10.23}$. At the competitive price of \$1.62, this demand curve predicts that 70,709,233 gallons of gasoline would be sold on the NJT. By charging higher prices, the gasoline service stations on the NJT reduce their sales by 4,314,209 gallons of gasoline per year. The annual loss of consumer surplus due to the price of gasoline being higher along the NJT is:

$$(5) \quad \int_{\$1.62}^{\$1.63} 9,835,914,055 \cdot P^{-10.23} dp = \$685,273.$$

Monopoly profits are the per-unit markup multiplied by the quantity sold. The extraordinary monopoly profits from being able to sell gasoline along the NJT without facing competition along the toll road equals $66,395,024 \cdot \$0.01 = \$663,950$. The dead-weight loss due to the gasoline service station monopoly pricing along the NJT is only \$21,323. This is not surprising since gasoline is cheaper on the NJT than on the GSP.

Using data on the value of food sold along a toll road, the difference in price between a market basket of food on and off the toll road, and the elasticity of demand for food, we can also estimate the loss in consumer surplus due to monopoly food

prices. We begin with the sale of food along the Garden State Parkway. In 2001, food sales along the GSP were \$41,956,143 [*Annual Report of the New Jersey Highway Authority*, 2001, 29]. Using the same methodology as above, at the competitive price food sales would have been \$129,025,187 along the GSP. Because food prices were 26.7 percent higher, food sales along the GSP fell by \$87,069,044. The deadweight loss due to the monopoly pricing was \$7,147,817. The monopoly profits for food sales were \$8,853,131. The total loss in consumer surplus due to higher food prices along the GSP was \$16,000,948.

Total food sales along the New Jersey Turnpike were \$60,974,770 in 2000 [Letter from Mr. David Trumpp, Marketing Coordinator, New Jersey Turnpike Authority, August 2001]. The market basket of food in Table 6 is 13.9 percent more expensive along the NJT. At the competitive price, food sales along the NJT would have been \$113,020,372. Higher food prices reduced food sales by \$52,045,602. The deadweight loss due to the monopoly pricing was \$2,783,620. The monopoly profits from food sales were \$7,443,358 at NJT service areas. The total loss in consumer surplus was \$10,226,977 due to higher prices for food along the NJT.⁹

CONCLUSIONS AND POLICY RECOMMENDATIONS

The higher prices on the Garden State Parkway, the Atlantic City Expressway, and the New Jersey Turnpike found in this study demonstrate that consumers face increased prices when there is a government-created monopoly for service providers at rest areas instead of vigorous competition. Prices for gasoline are higher at service areas along the Garden State Parkway and the Atlantic City Expressway. Food prices are dramatically higher at service areas along the Garden State Parkway, the Atlantic City Expressway, and the New Jersey Turnpike.

Consumers are clearly worse off when they are paying these marked-up food and gasoline prices on New Jersey's toll roads. As this research has demonstrated, consumer welfare along the GSP and NJT is annually reduced by \$5,475,027 because of higher gasoline prices and \$26,227,925 because of higher food prices. While our findings focus on the price and quantities of goods sold at monopoly service areas, economic theory also suggests that the quality of customer service may be reduced when competition is absent. The Executive Director of the NJT described poor customer service at gasoline service stations along the NJT in 1989 in strong terms: "Service is terrible. How they treat the public is a disaster" [Frank Holman quoted in "Turnpike Gas Price to Drop." *The Bergen Record*. 20 December 1989]. Economic theory predicts that not much has changed in service between 1989 and the present.

Economists have outlined the social costs of monopoly and argued for increased public attention to the ways in which sole providers of services are chosen and regulated. Of course, one potential way to control the excesses of monopoly power is through the implementation of price ceilings, with the important caveat that regulators must be aware of the marginal cost of production. In the case of toll road services, marginal costs, usually difficult for regulators to estimate, can actually be observed because of the presence of comparable non-toll road service providers. Yet, toll road authorities have not set price caps at the prices of comparable firms; instead, they allow higher prices. We have empirically demonstrated that toll road authorities allocate few, if

any, resources in establishing and then enforcing even caps above marginal cost. This is because it is in the best interest of toll road authorities to permit prices to rise above and beyond competitive prices to increase the royalties that service providers pay for exclusive operating rights.

Given these findings, what can be done to enhance consumer well-being along the toll roads? Three policy recommendations are particularly relevant. First, there is no sound reason to limit the number of service areas available to offer food and gasoline to travelers where land is ample for this type of development. New Jersey could work to eliminate legal barriers for firms that wish to provide services to travelers. In addition, New Jersey's toll roads should be open to proposals from businesses to create new service areas with new firms and brands that are currently unavailable. In brief, New Jersey's toll road authorities should encourage the possibility of private firms building new service areas and offering their products to the public.

In the meantime, while the current number of service areas is limited, lower prices could be promoted by encouraging competition among the different service areas. Why would a toll road authority want to encourage monopoly pricing by permitting only one gasoline company or only one food company to have exclusive operating rights along an entire roadway? To serve motorists using New Jersey's roads, toll road authorities should consider fostering competition among service areas by eliminating exclusive operating rights along an entire roadway. Increasing the number of service providers on each roadway should reduce prices for all consumers because of the enhanced competition.

Finally, in addition to increasing the number and variety of service providers on New Jersey's major toll roads, non-toll road service providers should be able to advertise on the toll roads. This would take the form of the standard "food and fuel" signs seen across the country, but not on the Garden State Parkway, the Atlantic City Expressway, and the New Jersey Turnpike, before each exit. In this way, consumers would then be informed of the other food and fuel options available to them, thereby increasing competition once again.

This paper has demonstrated the need for reform in the ways in which toll road authorities issue contracts to their service providers. While we have offered a short list of many potential recommendations, in the end it is up to state policymakers to select the reforms most suitable to their multiple constituencies. As this research has shown, however, the central guiding principle of any reform plan should be the same: consumers benefit when there is more competition along this nation's toll roads.

NOTES

The authors would like to thank Jeffrey Milyo, M.B. Crowley, and two anonymous reviewers for their assistance in the preparation of this manuscript. Generous funding was provided by the professional development fund at the Edward J. Bloustein School of Planning and Public Policy and the University Research Council, both at Rutgers, The State University of New Jersey. The authors are responsible for all remaining errors.

1. Governmental officials make these types of decisions frequently; see for example, Pennsylvania permitting the Edison Company to take over the management and operation of public schools in Philadelphia instead of permitting multiple firms to compete with each other in the same school district.

2. We are unable to find any reference to the economics of service areas along toll roads in the economics literature using the Econlit database. As the only exception, the Pennsylvania Legislative Budget and Finance Committee has produced a report that reviews prices for food and gasoline along the Pennsylvania Turnpike entitled "A Report on Operations and Pricing at Pennsylvania Turnpike Service Plazas, 1997."
3. We assume that the marginal costs facing toll road service providers and non-toll road service providers are roughly equivalent. We make this assumption based on the following reasons. The various inputs necessary for producing both food and gasoline are largely commodities, thereby equalizing costs across both toll road and non-toll road providers. The only difference in costs that toll road administrators identified in our interviews related to the operation of their twenty-four hour restrooms. This is a small cost overall and thus does not adequately account for the price differentials found in comparable toll road and non-toll road prices.
4. Interestingly, in recent years, New Jersey Turnpike authorities have permitted off-toll road hotels and motels to post signs about their businesses in limited areas along the Turnpike, but have continued their ban on advertising from potentially competitive off-toll road gas and food operators.
5. Telephone interview with Brian Gallagher of HMS Host. May 2001.
6. See the 1996 towing contract case decided by the New Jersey Supreme Court, N.E.R.I. Corporation v. New Jersey Highway Authority, 147 N.J. 223;686 A.2d 328.
7. Toll road operators are also permitted to round gas prices up to the nearest 9/10 of a cent.
8. Note that this is the estimated change in the quantity of gasoline sales if the price of the toll road increases, holding everything else equal including the price of gasoline off the toll road.
9. Of course, the same calculations could be done for the Atlantic City Expressway.

REFERENCES

- Agreement Between the New Jersey Highway Authority and HMSHost TollRoads, Inc.*, 2001.
- Agreement Between the New Jersey Highway Authority and McDonald's Corporation*, 1998.
- Agreement Between the New Jersey Highway Authority and Mobil Oil Corporation*, 1995.
- Agreement Between the South Jersey Transportation Authority and Sunoco, Inc.*, 1998.
- Annual Report of the New Jersey Highway Authority*, 2000.
- Annual Report of the New Jersey Highway Authority*, 2001.
- Cassell, M.** *School Bus Contracting: Is it Worth the Ride?* Paper Presented at the 22nd Annual Research Conference of the Association for Public Policy and Management. Seattle, Washington, 2000.
- Demsetz, H.** Why Regulate Utilities? *Journal of Law and Economics*, 1968, 55-65.
- Gasoline Operator Agreement Between New Jersey Turnpike Authority and Sun Company, Inc.*, 1992.
- Gallagher, B.** Telephone Interview, May 2001.
- Goldsmith, S.** *The Twenty-First Century City*. Lanham, MD: Rowman and Littlefield Publishers, 1999.
- Henig, J.** Privatization in the United States: Theory and Practice. *Political Science Quarterly*, 1989, 649-70.
- Hotelling, H.** Stability in Competition. *Economic Journal*, 1929, 41-57.
- Hoxby, C.** Does Competition among Public Schools Benefit Students and Taxpayers? *American Economic Review*, 2000, 1209-38.
- Laffont, J. and Tirole, J.** Using Cost Observation to Regulate Firms. *Journal of Political Economy*, 1986, 614-41.
- Operating Agreement for Turnpike Restaurants Between The New Jersey Turnpike Commission and HMS Toll Roads, Inc.*, 2000.
- Pennsylvania Legislative Budget and Finance Committee.** *A Report on Operations and Pricing at Pennsylvania Turnpike Service Plazas*, 1997.
- Posner, R.** The Social Costs of Monopoly and Regulation. *Journal of Political Economy*, 1975, 807-27.
- Rivkin, S.** Tiebout Sorting, Aggregation and the Estimation of Peer Group Effects. *Economics of Education Review*, 2001, 201-09.
- Ryan, D.** General Services Manager, Garden State Parkway. Personal Interview, June 2001.
- Savas, E. S.** *Privatization and Public-Private Partnerships*. Chatham, NY: Chatham House, 2000.
- Stein, R.** *Urban Alternatives-Public and Private Markets in the Provision of Local Services*. Pittsburgh: University of Pittsburgh Press, 1990.
- Tirole, J.** *The Theory of Industrial Organization*. Cambridge, MA: M.I.T. Press, 1993.

- Trumpp, D.** Marketing Coordinator, New Jersey Turnpike Authority. Personal Correspondence, August 2001.
- Turnpike Gas Price to Drop. *The Bergen Record*. 20 December 1989.
- Vickers, J., and Yarrow, G.** Economic Perspectives on Privatization. *Journal of Economic Perspectives*, 1991, 111-32.
- Warner, M., and Hebdon, R.** Local Government Restructuring: Privatization and its Alternatives. *Journal of Policy Analysis and Management*, 2001, 315-36.
- Zimmer, R. W., and Toma, E. F.** Peer Effects in Private and Public Schools across Countries. *Journal of Policy Analysis and Management*, 2000, 75-92.

Copyright of Eastern Economic Journal is the property of Eastern Economic Association and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.