AN EMPIRICAL STUDY ON OPTIMAL LOCATION OF GASOLINE RETAILERS

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Overview

We study optimal location of gasoline retailers in roads and highways. For that purpose, we rely on the infinitely repeated version of the spatial competition Hotelling's linear city duopoly model. Using our equilibrium conditions and relying on the existence variation in incumbent gas stations' posted prices and variable costs (wholesale prices or rack prices) from one period (day) to another, we identify points in the Cartesian plane of the distribution of consumers. Base on this distribution, we are able to calculate where should be located an entrant gas station to maximize consumers' welfare. We are also able to assess where to locate an entrant gas station to maximize firms' profits.

We apply our methodology to a novel dataset on prices and costs of pair of gas stations in straight highways in Spain. In doing so, our aim is to add some light to the bureaucratic process whereby the Spanish public administration evaluates potential locations and authorizes to open new gas stations along main highways.

In subsection 1.2 we briefly discuss some related studies. In section 2, we introduce the model of repeated price competition in a linear city model. Section 3 discusses the empirical challenges we face in our model and develops our estimation approach. Section 4 employs our methodology to study price competition in pair of gas stations in straight highways in Spain. Section 5 concludes.

Methods

Using the equilibrium conditions obtained in the repeated game, we employ non-linear least squares to estimate the shape paramenters of the distribution of consumers. We assume that this distribution falls in the family of the Beta distributions.

Data

Our dataset includes daily prices from October 2, 2014 to July 20, 2015. Data on prices is available for the most commonly used fuels in Spain for transportation purposes, namely unleaded gasoline (95 RON) and diesel A (regular). These prices were obtained from the Ministry of Industry's website. Posted prices obtained from the Ministry of Industry are tax-inclusive. Therefore, we subtract the taxes included in these prices

Data on costs for the same period (from October 2, 2014 to July 20, 2015) was obtained from *Platts*. Using data from both the Genoa market and the Rotterdam market, we build a representative index of the variable costs that face each gas station, according to the information provided by the Spanish Association of Operators of Oil Products (AOP) and the National Competition Commission (CNC).

The weighted average costs obtained from *Platts* are in dollars per metric ton. To convert from metric tons to liters, we use the reference density of unleaded gasoline (around 0.745 kg/l), and regular diesel fuel for vehicles (around 0.850 kg/l). We get a rate of 1315.78 l/metric ton and 1183.43 l/metric ton respectively. To convert from dollars to euros, we use the daily exchange rate from October 2, 2014 to July 20, 2015.

Results

For each pair of gas stations considered, we obtain the distribution of consumers along the road in which these gas stations are located. Using this distribution, we calculte the optimal location of an entrant to maximize consumers' welfare. Our estimation suggests that there are up to 1.5% welfare gains by following our optimal location rule.

Conclusions

This paper proposes a novel procedure to recover the distribution of consumers of pair of gas stations located in straight section of highways. The procedure relies on sufficient variation in incumbent gas stations' posted prices and variable costs (wholesale or rack prices) from one period to another.

This methodology is applied to data on prices and costs of pair of gas stations located along highways in Spain. Using the estimated distribution of consumers, we are able to precisely indicate where should be located a potential entrant to maximize consumers' welfare. Opening a gas station in a Spanish highway requires an authorization issued by the Ministry of Public Works and Transport about the convenience of the potential location. Hence, our methodology aims to add some light to this opaque bureaucratic process.

Besides the highway application, this methodology also has numerous potential applications. For instance, we can use it to determine the optimal position of oil and gas storage facilities along straight pipelines. In addition, we can use it to calculate the optimal location of power generation facilities along regions within a regional transmission organization (RTO).

Coming back to the gas stations case, possible extensions should take into account the potential existence of collusive behavior. In addition to that, further work should consider price inertia or rigidities in prices and costs. Finally, and considering that many Australian highways are straight and long, we seek to apply our methodology to data on gas prices from this country.

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