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Spatial clustering and market power: Evidence from the retail gasoline market

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ABSTRACT

We investigate the impact of local market power and 'spatial clustering' on prices in the retail gasoline market. The acquisition of Aral stations from BP in the Austrian gasoline market in 2003 provides a 'quasi-experiment' for identification of the causal effects of changes in spatial clustering on retail prices for a panel of gasoline stations. Our econometric analysis suggests that spatial clustering of gasoline stations reduces the degree of competition between firms and increases equilibrium prices. Merger simulations show that ignoring merger-induced changes in spatial characteristics will lead to a significant bias in the evaluation of merger effects.

1. Introduction

Changes in gasoline prices attract a lot of attention from consumers for several reasons. Firstly, consumers spend a considerable share of their income on gasoline and secondly, prices are displayed on large signs and thus are highly visible. Further, gasoline is a relatively homogeneous product, which leaves consumers questioning why its price varies so much over time and across stations. There is widespread perception that this regional price variation is caused by the lack of competition between suppliers. At the retail level consumers face transportation (time) costs when switching between gasoline stations which would allow retailers to exert local market power in charging consumers' excessive prices (above marginal costs). Further, gasoline stations often are members of a network of multi-station firms (large chains of gasoline stations) and coordinate their pricing behavior within the network. Coordinated price setting within multi-station retailers raises concerns about the lack of competition in this market and possible detrimental effects for consumers. Recent mergers between large firms have reinforced these concerns.

Theoretical models of spatial product differentiation have shown more formally that the distribution of independent suppliers in space influences the degree of competition and thus the level of equilibrium prices. Some theoretical studies have also discussed the impact of coordinated pricing behavior between members of a network of multi-station firms (Levy and Reitzes, 1992; Giraud-Héraud et al., 2003; Wenzel, 2011).

A number of recent papers in industrial organization have examined the importance of geographic differentiation for gasoline prices (Hastings, 2004; Hastings and Gilbert, 2005; Chouinard and Perloff, 2007; Taylor and Hosken, 2007; Simpson and Taylor, 2008; Houde, 2012); recent surveys are available in Hosken et al. (2008), Ashenfelter et al. (2009) and Eckert (2013). The existence of local market power by estimating the impact of spatial market characteristics on gasoline prices is difficult to identify since important determinants of price setting, such as local differences in demand and cost as well as the share of informed vs. uniformed consumers, typically are unobservable to the researcher (omitted variable bias problems). In markets where competition is localized (such as the gasoline market[2]), measuring the effects of coordinated behavior between gasoline stations is particularly difficult. In these markets the degree of competition is not only influenced by the number of competitors within a specific market area but also crucially depends on the degree of spatial clustering (the sequence of stations on a road) within this market.

To illustrate the problem, consider the following simple example in a Hotelling-style framework. As a reference situation, consider a sequence of five independent firms (*A–B–C–D–E*) distributed equidistantly on one segment of a market (a road). In this case, the specific sequence of firms (the order in which the firms are located on the

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[2] Chamberlin (1948) refers to the gasoline market as a prototype for what he calls 'localized competition': 'Retail establishments scattered throughout an urban area are an instance of what might be called a 'chain' linking of markets. Gasoline filling stations are another. In either of these cases the market of each seller is most closely linked (having regard only to the spatial factor) to the one nearest to him, and the degree of connection lessens quickly with distance until it becomes zero' (Chamberlin, 1948, p. 103).

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road) is irrelevant. If the five stations however do not set prices independently but coordinate their pricing behavior (by being a member of a multi-station firm), ownership and the sequence of firms becomes relevant. Consider the case of two firms (A and B) and five stations, where firm A controls three stations and firm B controls two. The specific sequence A_1–B_1–A_2–B_2–A_3 is characterized by the fact that the two neighbors of a particular location are both members of competing firms. Competition again will be intense and equilibrium prices will be identical to the reference situation with five independent firms. If, however, the sequence of stations is A_1–A_2–A_3–B_1–B_2, only two locations (A_3 and B_1) would intensively compete for customers. By choosing neighboring positions for their stations, firms avoid price competition since a smaller number of their stations will then face competition from rivals. Stations A_1, A_2, and B_2 are 'sheltered' from direct competition. One should expect the intensity of competition to be lower and thus the equilibrium prices to be higher if firms are 'spatially clustered' in this way, although local market concentration (based on the number and the identity of outlets, but independent of the sequencing of stations) is not affected by these differences in sequencing.

The aim of the present study is to investigate the impact of local market power on prices in the gasoline market. Specific emphasis will be given to the importance of coordinated price setting by introducing a measure of spatial clustering of competitors. To identify the causal effects of local market power and coordinated price setting between suppliers, the research design applied in the present study follows Hastings (2004) and Houde (2012) by using an event that caused sharp changes in the spatial distribution of competing gasoline stations. The acquisition of Aral stations from BP in the Austrian gasoline market in 2003 provides a 'quasi-experiment' for testing the effects of changes in spatial clustering on retail prices for a panel of gasoline stations. On the basis of individual observations before and after the station conversion period, we apply a 'difference-in-difference approach' and include station-level fixed effects as well as time fixed effects to control for potentially confounding factors at the station-level and over time. Our econometric analysis suggests that spatial clustering of gasoline stations reduces the degree of competition between firms and increases equilibrium prices.

The following Section 2 provides a short description of the industry background and discusses the research design as well as the relationship of this paper to the existing literature. Data and the definition of variables are described in Section 3. Section 4 reports results of regression estimates on the link between ownership structure, market geography and gasoline prices. Results from different merger-simulations are reported in Section 5. Section 6 summarizes and concludes.

2. Industry background, research design, and literature

The gasoline market in Austria is dominated by a small number of independent firms, each of them operating a large number of locations. At the beginning of the century BP was the largest firm and controlled 17.1% of all stations. Together with OMV (16.5%) and Shell (12.8%) these three firms (which we call 'major brands') comprised nearly half of all locations in 2000. Seven 'minor brands' (including Aral) controlled 30.5% of all stations whereas nearly one fourth of all locations were unbranded. All unbranded stations are treated as independent firms.

In May 2002, BP announced its plan to acquire sole control of VEBA Oel AG. At this time VEBA Oel was active mainly in Germany, but also in Luxembourg, some Eastern European countries as well as in the Austrian retail gasoline market (under the Aral brand). The EC concluded that the notified operation did not raise serious doubts as to its compatibility with the common market and with the EEA agreement (case No. COMP/M.2761 2761 — BP/VEBA). As a consequence of this acquisition, 98 gasoline stations that were operated by Aral in 2002 are fully controlled by BP at the beginning of 2003 (see Table 1).[3]

The acquired gasoline stations were rebranded under the BP brand in the beginning of 2003, but all station characteristics remained unaffected by the merger. As will be shown in the following section, this event caused sharp changes in spatial clustering of competitors in some regions while leaving our measure of spatial clustering unaffected in other regions. These discrete and differential changes in spatial clustering can be used to identify the causal effect of spatial clustering on pricing decisions.[4]

The research design used in present study is most closely related to Hastings (2004) and Houde (2012). Using a difference-in-difference approach, Hastings (2004) investigates the effects of a conversion of independent stations to company-owned stations (acquisition of 260 Thrifty stations by ARCO) in Southern California in the late 1990s. The treatment group is composed of all stations which are located within a one mile radius of a Thrifty station whereas the control group is composed of stations that never competed with a Thrifty station (i.e. where no Thrifty station is located within a one mile radius). Hastings concludes that the presence of independent retailers acts to decrease local retail prices. The pure rebranding effect of the transaction significantly increased retail gasoline prices.[5] A similar approach is used in Hastings and Gilbert (2005), Taylor and Hosken (2007), Simpson and Taylor (2008) and Houde (2012). Hastings and Gilbert (2005) examined the effects of Tosco's acquisition of Unocal's West Coast refining and marketing assets on wholesale prices in thirteen metropolitan areas in the U.S. The authors find that Tosco increased the wholesale price of gasoline in cities where it faced greater competition with independent retailers following the acquisition. Taylor and Hosken (2007) examine the effects of a joint venture between two oil companies on retail gasoline prices in four cities in Kentucky and Virginia. Although this joint venture significantly increased wholesale and retail market concentrations, the authors did not find significant effects on retail gasoline prices in the year following the transaction. Simpson and Taylor (2008) provide empirical evidence on the consequences of an acquisition (MAP acquired the Michigan assets of UDS) in the Michigan oil market in 1999. The authors compare price movements in six Michigan cities affected by the acquisition with price movements in two nearby cities unaffected by the acquisition and find no evidence that this acquisition led to higher prices for consumers. Houde (2012) analyzes the consequences of a merger between two of the largest retail gasoline companies in Canada (Ultramar and Sunoco) for the Quebec City gasoline market. The author also finds that prices were indeed higher after the merger in the treated neighborhoods. In a very careful empirical exercise, the author compares the results of merger simulation analysis with an ex-post merger evaluation. The main contribution of this study to the existing literature on spatial differentiation is to

[3] It should be noted that this transaction was a follow up to the BP/E.ON case M.2533 (http://ec.europa.eu/competition/mergers/cases/decisions/m2761_en.pdf): BP and E.ON (the mother company of VEBA) signed a 'Participation Agreement' in July 2001 (which was put into effect on February 1st 2002) that BP acquires 51% of the shares of VEBA Oel. The parties agreed that they jointly decide on strategic issues, so BP did not get sole control on VEBA at this time. The parties also agreed that E.ON gets a put option for the remaining 49% of its shares on VEBA. E.ON exercised this put option and the EC approved the acquisition (see http://ec.europa.eu/competition/mergers/cases/decisions/m2761_en.pdf) in June 2002. VEBA was integrated into the BP group at the end of 2002 and the Aral stations were converted into BP stations at the beginning of 2003.

[4] Note that Aral stations were geographically dispersed all over the country and the locations were predetermined to BP's acquisition decision. It is therefore plausible to treat changes in spatial concentration in a local submarket as an exogenous shock to a rival stations' pricing decision, after controlling for fixed time and station-level effects.

[5] This effect is identified separately from changes in horizontal concentration and differences in the degree of vertical control, for which no effect on prices was found. The magnitude of this effect is however questioned by a recent study — for more details on the discussion of this case see Taylor et al. (2010) as well as Hastings (2010).