Time as a Strategic Variable: An Empirical Analysis of Opening Hours in the Austrian Gasoline Market

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1 Introduction

While business hours of firms still are strongly regulated in many markets, some countries took first steps towards deregulation at least for a few sectors of their economy in recent years. This deregulation provides firms with new opportunities in setting business hours strategically in competing with rivals.

The importance of strategic interactions between firms when choosing opening hours is nicely illustrated in de Meza (1984): “An argument commonly advanced by traders opposing liberalization starts by observing that if a few shops were to choose to open on Sunday they would attract so much business from retailers trading only on weekdays that soon all shops would be forced to open on Sunday. [...] A counter-argument denies that all shops would be forced to open on Sundays” (de Meza (1984), p.379). Whether or not an extension of opening hours of one firm 'forces' competitors to act similarly - i.e. whether opening hours are strategic complements - can have important consequences for market performance (Vives (2005)). It is well-known that multiple equilibria are typical in the presence of strategic complementarities, which makes comparative statics and policy analysis difficult. How can the policymaker be sure that changing a parameter has the desired effect?

While some very elaborate theoretical models on firms' strategic choices of opening hours have been presented and discussed in industrial organization (Kay and Morris (1987), Inderst and Irmen (2001), Shy and Stenbacka (2008), Wenzel (2010), Wenzel (2011)), no empirical evidence on firms' strategic choices of business hours is available so far. This lack of empirical evidence might be due to the fact that shop closing laws in many sectors of the economy still are too restrictive to allow economists observing strategic interactions in business hours to unfold in practice. One of the few exceptions of markets, where business hours are liberalized in Austria, is the retail gasoline market. According to the “Öffnungszeitengesetz” (2003), gasoline stations in Austria are free to choose their desired business hours. A further advantage of analyzing opening hours in the gasoline market is that gasoline is a rather homogenous product; the main source of product differentiation is the location of a gasoline station. With the availability of data on the location of gasoline stations in space, the specific neighborhood relations between individual gasoline stations and thus the degree of horizontal product differentiation can be identified[1].

The aim of the present analysis is to provide first empirical evidence on the strategic choice of opening hours. Specific attention will be given to the inter-

[1] An excellent discussion of the available empirical literature on this market is available in Eckert (2011).

action between horizontal (spatial) differentiation and quality choices (opening hours). The following section two provides an overview of different theoretical models on the strategic choice of opening hours in markets with imperfect competition. Section three describes the data and the empirical approach. Result are reported and discussed in section four.

2 Theoretical Background

Opening hours can be interpreted as a quality attribute of retailers which positively influences consumers' willingness to shop at their store. Ferris (1990) investigates consumers' utility maximizing behavior under a time constraint and shows that longer opening hours exert a positive effect on consumers' willingness to pay for products sold at these stores. Additional arguments for a positive effect of opening hours on willingness to pay emerge when explicitly considering the effects of uncertainty. When consumers are uncertain about when they want to shop, for example, opening hours might incorporate a real option value by creating flexibility in the eyes of consumers' (Shy and Stenbacka (2008), p.1194). Similarly, consumers may be uncertain about the precise timing of opening hours of a store. Thus, stores with long opening hours (or the reputation of it) might be preferred by consumers (Kosfeld (2002)).

When interpreting opening hours as a quality attribute of the retailer, industrial organization models with endogenous quality choice are a natural starting point for understanding the strategic effects of choosing opening hours. This literature, however, provides conflicting predictions on the form of the strategic interaction in quality levels (opening hours): whether quality levels are strategic complements or strategic substitutes is conditional on the particular structure of the model. More specifically, the slope of firm's reaction function depends on whether firms' profit functions are sub- or supermodular.

Consider a duopoly market in which firms set quality levels (opening hours) in the first stage and then compete on prices. Let $\Pi_1 = \Pi_1 \left[h_1, h_2, p_1(h_1, h_2), p_2(h_1, h_2)\right]$ denote firm 1's profit as a function of opening hours (h_1, h_2) and prices, and let $p_1(h_1, h_2)$ and $p_2(h_1, h_2)$ denote the second-stage optimal prices conditional on opening hours. The first-order condition for choice of h_1 is $\partial\Pi_1/\partial h_1 = 0$. Totally differentiating this condition yields: $d\frac{\partial\Pi_1}{\partial h_1} = \frac{\partial^2\Pi_1}{\partial h_1^2}dh_1 + \frac{\partial\Pi_1}{\partial h_1 \partial h_2}dh_2$. From this, the slope of firm 1's reaction function is: $\frac{dh_1}{dh_2} = -\frac{\partial\Pi_1}{\partial h_1 \partial h_2} / \frac{\partial^2\Pi_1}{\partial h_1^2}$. Since the denominator of this equation must be negative for the second-order condition to be satisfied, the slope will take the sign of the cross-partial derivative in the numerator. This sign of $\frac{\partial\Pi_1}{\partial h_1 \partial h_2}$ will generally be ambiguous and dependent on the detailed structure of the model (i.e. whether a 'differentiation effect' or a 'demand stealing effect' is more important).

Textbook models of pure vertical differentiation with heterogeneous consumers in the tradition of Gabszewicz and Thisse (1979) and Shaked and Sutton (1982) focus on the 'differentiation effect' of quality changes (opening hours): competitors differentiate qualities in order to relax price competition. In this framework, Ronnen (1991) shows that $\frac{\partial \Pi_1}{\partial h_1 \partial h_2} > 0$: the best response to an increase in a rival's product quality is to increase quality of your own product. As the high-quality seller raises quality and thus expands the disparity between qualities, price competition is alleviated and, as a result, the low-quality producer has a stronger incentive to raise quality. When the low-quality seller raises quality and thus becomes a closer substitute to the high quality seller, the incentive of the high-quality seller to differentiate himself from the low-quality seller becomes stronger. Aoki and Prusa (1996) further show that this conclusion is unaffected by the timing on the quality choices of duopolists (i.e. whether quality decisions are made simultaneously or sequentially). In the terminology of Bulow, Geanakopolis, and Klemperer (1985), qualities (opening hours) are locally strategic complements in this modelling framework.[2]

This contrasts with a second type of models, inspired by the seminal work of Economides (1989), where vertical differentiation is introduced alongside with the imperfect substitutability of goods stemming from horizontal differentiation. This approach suggests that quality levels (opening hours) are strategic substitutes. Economides investigates a three-stage game where two firms choose their location on the Hotelling line as well as the quality of their products before setting prices. In this model, an increase in opening hours of one firm is assumed to lead to a proportional increase in consumer demand for this firm. At the same time, consumer demand for the rival's product and the rival's marginal returns of quality decreases: the sign of $\frac{\partial \Pi_1}{\partial h_1 \partial h_2}$ is negative. Increasing opening hours has a 'demand stealing' effect on rivals. modifies this setting to consider the case of n firms competing on a circular market. In the same framework, Wenzel (2010) analysis firms' entry and exit decisions in a circular market to investigate the relationship between opening hours and the concentration in the retail sector. Again, business hours are strategic substi-

[2]Aoki (2003)) extends this analysis by comparing price and quantity competition in the second stage: "Product market competition matters because qualities are locally strategic complements with Bertrand competition but are locally strategic substitutes with Cournot competition in the relevant range"(Aoki (2003), p.654).

tutes (although this is not explicitly highlighted by the authors). [3]

An important advantage of this approach is that horizontal and vertical differentiation are investigated simultaneously (Economides (1993)). Previous empirical research in the gasoline market also finds that both, horizontal (i.e. spatial) as well as vertical differentiation (via opening hours) are key factors in explaining firm performance in the gasoline market (Pennerstorfer and Weiss (2013)). An important characteristic of the retail gasoline market is that gasoline stations often are members of a network of multi-station firms (large chains of gasoline stations) and coordinate their strategic behavior within the network. The implications of neighborhood relations and coordinated behavior within the network of multi-station firms for strategic decisions on opening hours has recently been investigated in Wenzel (2011).

Wenzel investigates competition between an independent retailer operating a single station and a retail chain operating two stations. The author shows that the independent retailer can gain more from extending opening hours than its competitor. By extending opening hours, the independent retailer attracts customers from both neighboring stations (both owned by the retail chain). Conversely, the retail chain can only gain customers from one station, but has to pay the costs twice (once for each affiliated station). This model suggests (a) that the strategic choice of opening hours differs between independent retailers and members of a retail chain, and (b) that the location of firms in space matters for their choices of opening hours.[4] Note that in following previous research (Inderst and Irmen (2001), Shy and Stenbacka (2008)) the choice of opening hours in Wenzel (2011) is a discrete one: a store can either choose part-time shopping hours or full-time shopping hours (authors distinguish between opening during day-time and/or night-time). Each consumer is assumed having an ideal shopping time and they only care whether a store

[3]Note that the specific way in which opening hours increase consumer demand is not particularly important. Following de Meza (1984) and Ferris (1990), for example, shopping hours can be related with transportation costs; if a consumer cannot shop at her most preferred point in time (because the shop is closed), her opportunity costs of time for shopping at a different point in time will be higher. Longer opening hours thus tend to decrease consumers' opportunity costs of time (and thus reduce transportation costs). In contrast to Economides (1989), this decrease in transportation costs not only raises consumers' utility but at the same time increases the degree of substitution between products. The main focus of de Meza (1984) and Ferris (1990), however, is on the welfare consequences of a de-regulation of shopping hours and the strategic interactions between individual firms in choosing opening hours is not explicitly analyzed. In appendix A, we show that opening hours are strategic substitutes in this framework too.

[4]Wenzel (2011) shows that this result depends significantly on efficiency differences between the retail chain and the independent retailer. If the efficiency difference is small, the independent retailer may choose longer shopping hours than the retail chain. The opposite result emerges when the efficiency difference is large.

is open at that time or not. Thus, consumers do not care about the length of shopping hours per se and the optimal length of opening hours (which is the main focus of the present analysis) is not derived explicitly. Further note, this set-up does not allow deriving best-response functions for competitors' opening hours: rather a (perfect) coordination in choosing opening hours is assumed for members of the retail chain.

In the next step we study the strategic interdependence between competitors in setting business hours in the Austrian gasoline market empirically. Specific attention will be devoted to the impact of spatial differentiation (location) of stations as well as the differentiation between independent suppliers and members of large retail chains.

3 Data and Estimation Strategy

The present empirical analysis uses data on opening hours, location, and a number of specific characteristics (whether the station has service bays, a convenience store, the number of pumps, etc.) of 2,646 gasoline stations in Austria in 2010. Figure 1 in appendix A suggests that gasoline stations are open for 17 hours on average; figure 1 also reveals some variation in opening hours between gasoline stations. A noticeable feature of this figure further is the large number of gasoline stations that are open for 24 hours, some of these stations (rd. 10 per cent) are located on highways. Remarkably, the Austrian gasoline market is characterized by a huge number of different brands (see figure 2), which can be seperated into major and minor brands. Majors are the large (internationally operating) gasoline chains, *OMV, Shell, Esso, PB* and *Agip*. The smaller (local) brands (e.g. *Jet, Aral, Turmoel,* etc.) fall into the category "minor". However, a lot of independent (noname) stations are competing in the Austrian gasoline market as well. Another point worth looking at in some detail is the ownership structure in the gasoline market. A petrol station can be either independent, dealer owned or comany owned. As a result, the fact that a station has a specific label, for example "OMV", does not mean that OMV is the owner of this station. Instead, if the station is branded but dealer owned it is run as a franchise and the dealer just has to meet certain guidelines provided by the franchisor, in our example OMV.

To characterize the spatial distribution of suppliers and to measure distances and neighborhood relations between gasoline stations we collect information about the structure of the road network. Using data from ArcData Austria and the ArcGIS extension WIGeoNetwork, the geographical location of the individual gasoline stations are linked to information on the Austrian road system to generate accurate measures of distance. We further supplement the individual data with demographic data (population density, commuting behavior and importance of tourism) of the municipality, where the gasoline station is located. This information is collected by the Austrian statistical office ('Statistik Austria'). The definition of all variables as well as some descriptive statistics is provided in table 1 in appendix A.

A strategic interdependence in opening hours implies that firm i's decisions on opening hours (h) are not only influenced by i's own characteristics (captured by the matrix X) but also by rival's decisions on opening hours. The specification of the empirical model that accounts for both effects is given by the following spatial autocorrelation (SAC) model[5]:

$$\begin{aligned} h &= \rho W h + X\beta + u \qquad (1) \\ u &= \lambda W u + \epsilon \\ \epsilon &\sim N(0, \sigma_\epsilon^2), \end{aligned}$$

where h is a $m \times 1$ vector of stations' opening hours and m is the total number of observations (2,646 gasoline stations). The spatial weights matrix W is of dimension $m \times m$ defining neighborhood relations between gasoline stations. Let w_{ij} be the element in the ith row and the jth column of W. Then w_{ij} is set equal to zero if the j th station is not among the 10 nearest neighbors of i and is set equal to the inverse of the driving time from station i to station j otherwise[6]. X is an $m \times k$ matrix of k explanatory variables including a constant and ϵ is the $m \times 1$ vector of i.i.d. residuals. β is a $k \times 1$ vector of coefficients of the exogenous variables in X. The parameter estimate of ρ measures the (spatially weighted) strategic interaction of opening hours between neighboring stations. A positive (negative) parameter estimate of ρ implies that opening hours are strategic complements (strategic substitutes). Note that the SAC model also controls for unobserved spatial correlation (correlation of residuals between neighboring stations). In the absence of any strategic interaction between neighboring gasoline stations, a non-zero correlation of their opening hours might emerge as a result of similar (unobservable) local characteristics of these gasoline stations. The parameter λ measures the spatial correlation of

[5]Unfortunately, data on consumer demand (the quantity of gasoline purchased at individual stations) is not available. Estimation of a structural model of opening hours and pricing thus is impossible. Instead, we aim at inferring the strategic interdependence between firms from a reduced form spatial model on opening hours.

[6]All rows of the matrix are normalized.

residuals. A spatial autoregressive (SAR) model would be a less general form of the above model assuming that the residuals are i.i.d. (0,σ^2).

To define a market by considering a certain number of neighbors makes sense for two reasons. First, due to topologic characteristics the Austrian gasoline stations are mostly clustered into local markets[7]. Second, defining a market by using a critical radius (either in driving time or in driving kilometers) would lead to differentiation problems between rural and urban regions. Obviously, defining a market by choosing a critical distance of, for example, 15 driving minutes would seem reasonable when thinking of Vienna, Austria's capital city. However, in the countryside there are a lot of petrol stations which do not have any neighboring stations within this critical radius, but whose competitors are farther. Conversely, when choosing a larger critical radius to make sure every station has at least one neighbor would result in defining Vienna as one big market. But certainly not each and every petrol station within Vienna competes directly with each other. Therefore, using the kth nearest neighbor method to define markets seems to be the most convenient way[8].

In this analysis we extend equation 1 by using more than one weighting matrix with regard to the dependent variable instead. The goal is to differentiate between independent stations and those that are members of a network of a multi-station firm. The full weighting matrix W is split up into two matrices, W_1 and W_2[9], where the former contains only neighboring group members, which are company owned and the latter includes neighbors from different groups as well as dealer owned stations. Following Wenzel (2011) we assume a difference in a station's reaction to neighbors depending on whether the neighbor is owned by the same multistation firm or if it is a "true" competitor.

$$
\begin{aligned}
h &= \rho_{Group} W_1 h + \rho_{noGroup} W_2 h + X\beta + u \qquad (2)\\
u &= \lambda W u + \epsilon \\
\epsilon &\sim N(0, \sigma^2_\epsilon),
\end{aligned}
$$

[7]In visual support of the argument an arbitrary screenshot of Austrian petrol stations is provided in table 3.

[8]The results are robust when defining the market by the next 15 instead of the next 10 neighbors.

[9]We use the inverse distance and row normalize W_1 and W_2.

4 Empirical Results and Extensions

Results from two different specifications are reported in table 2. Model 2 allows differentiating between the strategic interaction in opening hours between gasoline stations that are members of the same network as well as those that are independent or are members of competing networks. The parameter estimate for ρ_{Group} suggests a significant (but imperfect) coordination in the setting of opening hours among members of the same network: a positive parameter estimate for ρ_{Group}, which is significantly different from zero at the 1%-level, implies that opening hours are strategic complements. An increase of opening hours by one gasoline station is associated with an increase in opening hours of neighboring group members. The parameter estimate of $\rho_{noGroup}$, which captures the strategic interdependence between independent stations or members of competing networks, is also positive but only significant on a 10%-level. This might be the result of the two countervailing effects described in section 2 (the 'differentiation effect' and the 'demand stealing effect').

The specification of the spatial weights matrices W implies that the strength of this strategic effect between firms depends on the degree of horizontal differentiation (distance between competitors in space) and decreases with the inverse of the driving time from station i to station j. This highlights the importance of considering the relationship between vertical and horizontal product differentiation. Note that the observed strategic interaction between neighboring gasoline stations is not the result of similar (unobservable) local characteristics of these gasoline stations. This spatial correlation of residuals is captured by the parameter λ, which is positive and significantly different from zero in both specifications.

Table 2 further includes a variable that aims at measuring the intensity of spatial competition between rivals. The parameter estimate for a variable measuring the distance to the nearest neighbor (DistNext) is negative and significantly different from zero at the 1%-level. Gasoline stations thus tend to open longer hours in areas where competition is more intense, ceteris paribus.

Most other control variables are significant, carry the expected sign and are robust to modifications of the empirical specification. A proxy for regional variations in consumer demand, population density (POPDENS), also carries a positive sign in both specifications. We find that stations located at highly frequented roads (TRAFFIC) have longer opening hours; on average their business hours exceed those located at less frequented roads by more than one hour per day. Since commuters tend to be better informed about all relevant features of gasoline stations (including opening hours), this variable not only can be interpreted as a proxy for demand but also for competition. A larger share of commuters in a specific region tends to increase opening hours, however this coefficient is not significant. Company owned stations (COMPANY) tend to have longer opening hours than dealer owned stations (the reference category); on average, the difference amounts to half an hour per day. Many locations offer additional amenities, like service bays (GARAGE), convenience stores (SHOP) or car wash facilities (CAR WASH). These variables can be associated with higher costs but at the same time should affect consumer demand positively. Table 2 suggests that locations offering service bays (GARAGE) and convenience stores (SHOP) tend to have shorter opening hours, while running a car wash is related to longer opening hours. We further find that larger gasoline stations tend to have longer opening hours. The parameter estimate for the AREA variable, measuring the size of the station in square meters, is positive and significantly different from zero in both specifications. The number of pumps (PUMPS), however, does not exert a significant impact on business hours. The five major brands operating in Austria (Agip, Esso, BP, OMV and SHELL) tend to have significantly longer opening hours than minor brands (e.g. ARAL, JET, AVANTI or Stroh) as well as unbranded stations (the reference category).

In order to confirm that the results are not driven by the specific definition of market boundaries and neighborhood relations, regressions were run using perturbations of these definitions as well as including additional measures of local market concentration, and the results were robust to these changes. The signs and significance of explanatory variables remained the same, although the point estimates varied slightly by a statistically insignificant amount. Results from these estimation experiments, which are available from the authors upon request, show that our results described above are robust with respect to these modifications.

In table 3 we choose a different approach. Looking at figure 1 one of the more prominent characteristics the the distribution of opening hours is the spike at 24 hours. One possible way to handle stations which are all day open is to use a tobit model accounting for the right hand side truncation at 24. The results for a tobit model with spatial correlation in the dependent variable are shown in table 3. The parameter for spatial autocorrelation, ρ is positive and significantly different from zero. The coefficients of the other explanatory variable are similar to our results in table 2 in size and signs. Additionally, we includes interaction terms between the distance to the next neighbor and our dummy variable indicating if the next neighbor is from the same group. Interestingly, it turns out that the distance to the next station is only significantly negative for neighboring stations of different groups or independents. In contrast, the distance seems to be irrelevant if the next neighbor is a group member.

It is well known that the regression results above cannot be interpreted directly as the partial derivative of the dependent variable with respect to the explanatory variable, because any explanatory variable can potentially influence the dependent variable in other regions as well and thus one is confronted with feedback loops. To calculate the indirect, direct and total effects of the coefficients above to do a propper analysis of the explanatory variables' effects on the chosen length of opening hours is still to be done. In addition, to properly handle the issue of the all-day-open stations we would like to estimate a spatial heckit model as was presented by Flores-Lagunes and Schnier (2012). We think it plausible that in a first step a station decides whether or not to open all day long. If it choose to open for less than 24 hours, then in a second step the station makes its decision about the actual number of hours to be opend. This procedure could be directly carried into a heckman approach, where the first step is estimted by a probit model with SAE, and the second step is conducted only for the stations which are open for less than 24 hours by estimating a linear model with SAE including the inverse Mills ratio to account for the selection bias. However, in addition to the model of Flores-Lagunes and Schnier (2012) for our purposes it would be necessary to include a spatial lag of the dependent variable as well to be able to gather information about strategic interaction of opening hours.

Note that the present analysis has exclusively focused on the total number of opening hours of retailers. We find some first empirical evidence for a strategic interdependence in decisions on opening hours for neighboring gasoline stations. Opening hours tend to be strategic complements; the positive strategic interaction is particularly strong for gasoline stations that are members of the same network of a multi-station firm. Further, we find that the intensity of spatial competition tends to increases opening hours.

However, we need to keep in mind that the present empirical analysis exclusively focuses on the total number of business hours and thereby ignores one important dimension of choosing opening hours: the degree of 'overlap' of opening hours between neighboring stations. Two neighboring gasoline stations, that are open for 12 hours each, could either compete intensively for the same customer if both open during day-time. However, the same number of opening hours would not lead the two stations to compete for the same group of customers if one station opens during day-time while the other opens during night-time. By differentiating between the total number of opening hours and the 'overlap' of hours in future empirical research, we hope to be able to better isolate the 'differentiation effect' and the 'demand stealing effect' and thereby improve our understanding of the determinants and consequences of opening hours.

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A Appendix

Figure 1: Histogram of open hours (incl. all Austrian petrol stations in 2010)

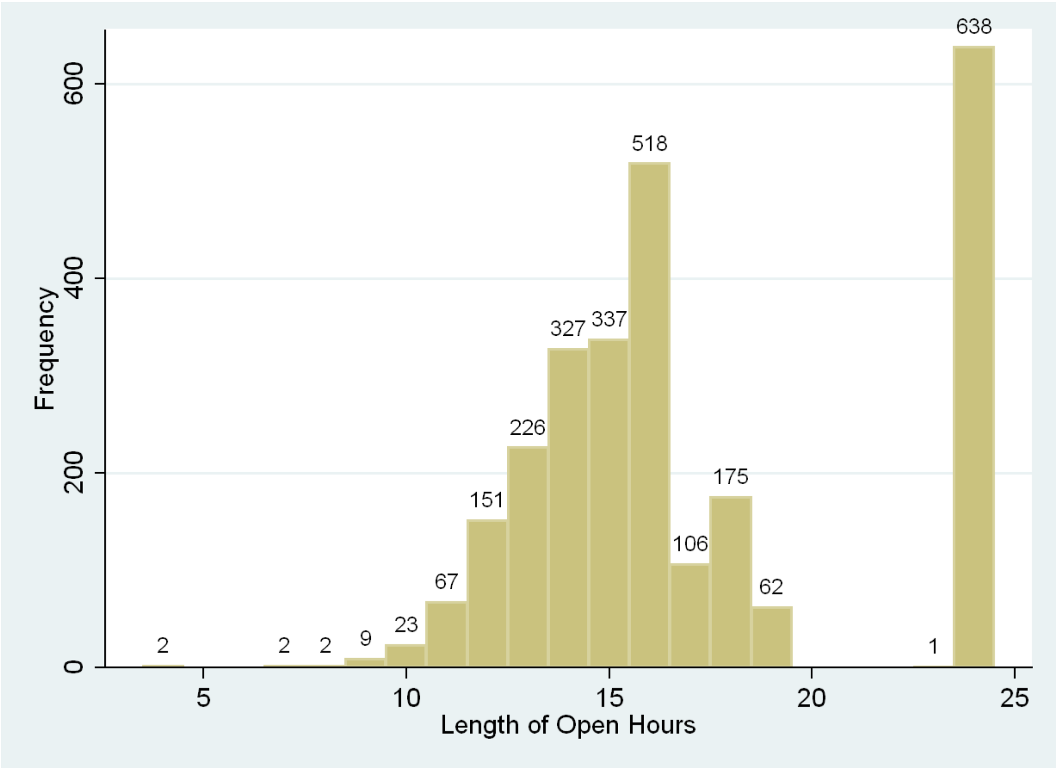

Figure 2: Brands of the Austrian petrol stations in 2010

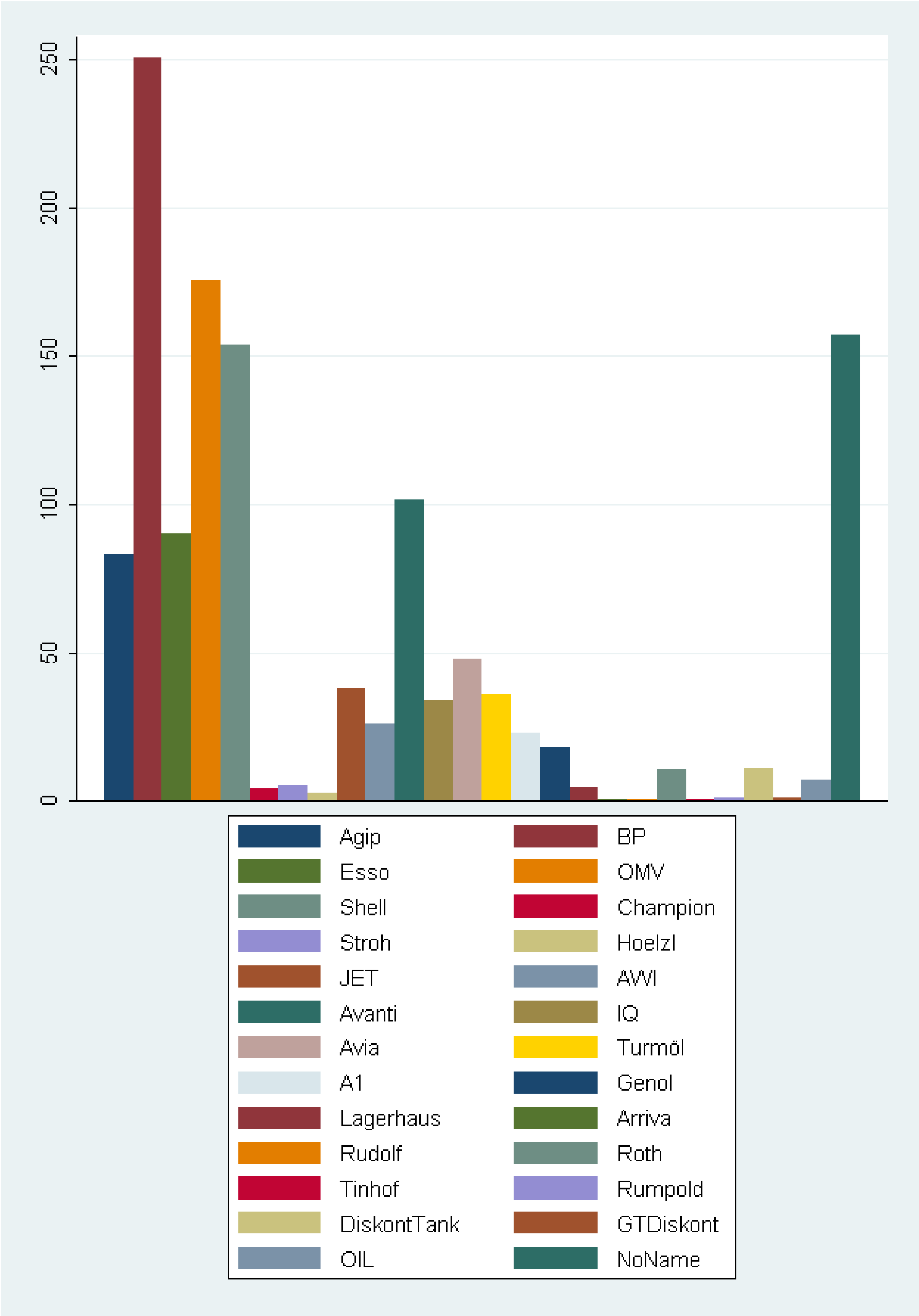

Figure 3: Local Markets

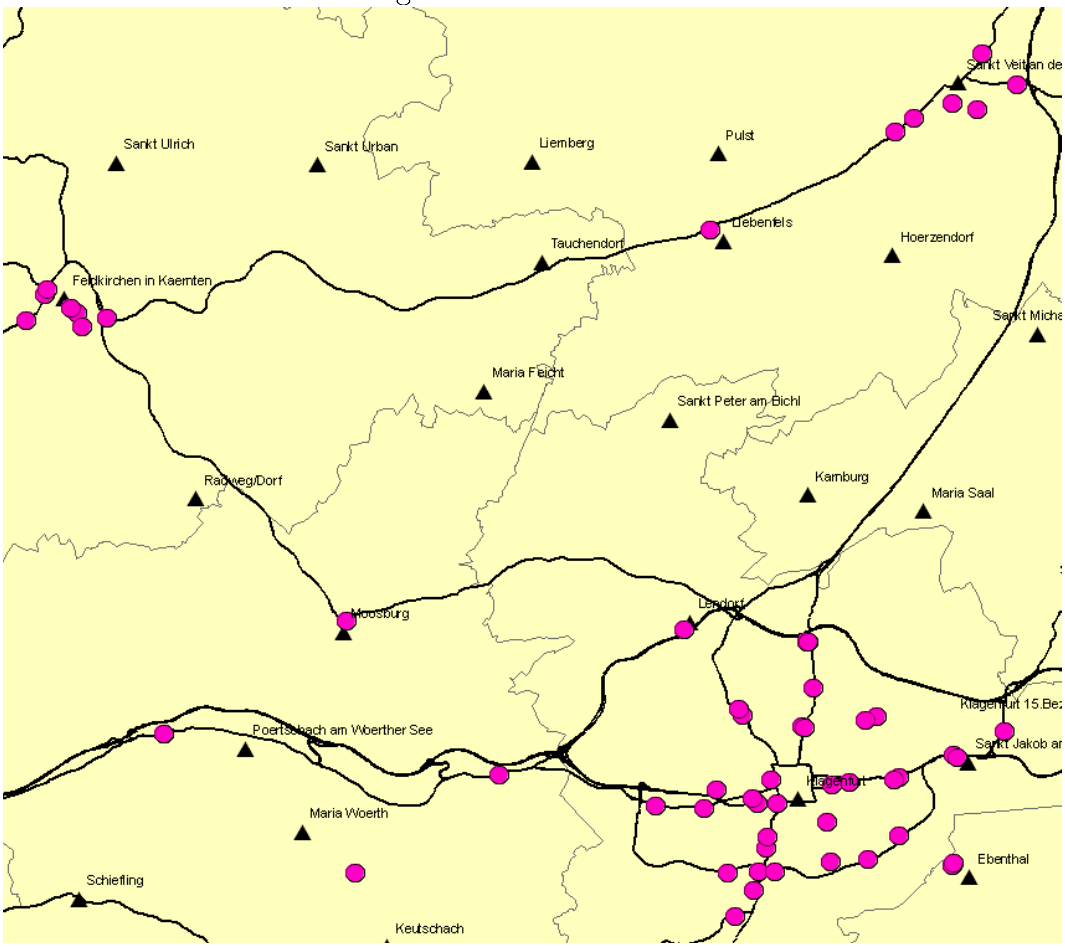

Table 1: Variable Details

Variable	Mean	Std. Dev.	Min.	Max.	N	Description
Dependent variable						
HOURS	17.04384	4.3279	4	24	2660	Total amount of open hours per day
Measures of competition						
DISTNEXT	2.3353	2.6610	1.0000e-003	22.6490	2646	Distance to the next neighboring station in driving kilometers
MEMBERS3KM	0.0431	0.1377	0	1	2646	Number of group members within a radius of three (driving) kilometers divided by total number of competitors
NEXTNBGROUP	0.0767	0.2662	0	1	2646	Dummy variable equal to one if the next neighbor is a group member
Measure of demand						
COMMUTERS	0.5372	0.2181	0.0726	0.9260	2701	Ratio of incoming plus outgoing commuters to population
POPULATION DENSITY	29934.97	58506.22	3	265318	2700	Population density of the municipality in thousands inhabitants per squared kilometer
TRAFFIC EXCELLENT	0.1325		0	1	2701	Dummy variable equal to one if road traffic at the location is heavy
Site characteristics						
PUMPS	2.8116	1.1546	1	9	2648	Number of pumps per station
AREAESIZE	1763.694	2167.812	15	40000	2664	Size of a station's area in square meters
HIGHWAY	0.0276	0.1638	1	9	2648	Dummy variable equal to one if the station is located on a highway
COMPANY OWNED	0.6061	0.4887	0	1	2701	Dummy variable equal to one if the station is owned by the oil company
SERVICEBAYS	0.4343	0.4958	0	1	2701	Dummy variable equal to one if the station also has its own garage
SHOP	0.8108	0.3917	0	1	2701	Dummy variable equal to one if the station also has a shop included
CARWASH	0.6335	0.4819	0	1	2701	Dummy variable equal to one if the station has a car wash
MINORS	0.3239	0.4680	0	1	2646	Dummy variable equal to one if the station is affiliated with a minor
MAJORS	0.5121	0.4999	0	1	2646	Dummy variable equal to one if the station is affiliated with a major

Table 2: Estimation Results

	SAR			SAC		
Variable	Coef	t-stat		Coef	t-stat	
Const	16.9040	24.1825	***	16.7840	23.2181	***
Areasize	0.0004	9.5953	***	0.0004	9.6539	***
Pumps	-0.0258	-0.3476		-0.0191	-0.2571	
Population Density	0.0039	1.9854	**	0.0037	1.8347	*
Company-owned	0.4197	2.0638	**	0.5018	2.4159	**
Shop	-2.3189	-9.5571	***	-2.2646	-9.3194	***
Carwash	0.6072	3.1588	***	0.5773	3.0098	***
Servicebays	-1.2927	-7.9243	***	-1.2667	-7.7653	***
Traffic excellent	1.1373	4.2619	***	1.1490	4.2849	***
Highway	3.4528	6.0193	***	3.5992	6.2688	***
Commuter	1.0476	1.5649		0.9891	1.4669	
Minors	0.4509	1.7740		0.4374	1.7162	*
Majors	0.5708	2.1837	**	0.5751	2.1937	**
Members3KM	1.0194	1.5168		1.1810	1.7087	*
NextNBGroup	-0.5620	-1.6972	*	-0.5599	-1.6864	*
DistNext(km)	-0.2002	-2.8300	***	-0.2010	-2.8474	***
$Dist^2$(km)	0.0075	1.2728		0.0079	1.3490	
ρ*Group	0.0392	3.7618	***	0.0255	2.1088	**
ρ*NoGroup	0.0527	1.6852	*	0.0551	1.6791	*
λ				0.1083	2.9372	***
Province-Dummies	Yes			Yes		
LogLikelihood	6431.7000			6427.1000		

Table 3: Estimation Resultsb Tobit

	SAR-Tobit			SAR-Tobit		
Variable	Coef	t-stat		Coef	t-stat	
Const	16.8583	24.7143	***	16.7899	24.5395	***
Areasize	0.0004	9.7606	***	0.0004	9.5820	***
Pumps	-0.0341	-0.4496		-0.0329	-0.4327	
Population Density	0.0039	1.9656	**	0.0038	1.9079	*
Company-owned	0.7446	3.8871	***	0.7517	4.0041	***
Shop	-2.3880	-10.0297	***	-2.4028	-9.5200	***
Carwash	0.6105	3.1987	***	0.6125	3.2813	***
Servicebays	-1.2965	-7.6370	***	-1.2871	-7.8816	***
Traffic excellent	1.1353	4.1780	***	1.1284	4.2243	***
Highway	3.4752	6.1602	***	3.4933	6.2084	***
Commuter	1.1288	1.7078	*	1.0902	1.6543	*
Minors	0.4546	1.7871	*	0.4599	1.7999	*
Majors	0.6823	2.6227	***	0.7083	2.6732	***
Members3KM	1.4101	2.1054	**	1.1118	1.5978	
NextNBGroup	-0.5584	-1.6519	*	-0.1329	-0.2421	
DistNext(km)	-0.1942	-2.7084	***			
$Dist^2$(km)	0.0076	1.2685				
Dist*Group				-0.2519	-1.1472	
$Dist^2$*Group				-0.0009	-0.0559	
Dist*NoGroup				-0.2094	-2.7781	***
$Dist^2$*NoGroup				0.0109	1.6801	*
ρ	0.0574	1.8363	*	0.0608	2.0100	**
Province-Dummies	Yes			Yes		