1 Appendix

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1.1 Discussion of Effects of Control Variables

Table 1 in the main text includes a number of additional control variables. We find that larger stations have shorter closing hours; the parameter estimate for *SIZE* is negative and significantly different from zero. Provided that a station's size is associated with cost advantages, this finding is consistent with Inderst and Irmen (2005). Company owned stations ($COMPANY$=1) tend to have shorter closing hours than independent dealer owned stations (the reference category). This result corresponds to Wenzel (2010) who points out that a retail chain may choose longer shopping hours than an independent station, if the efficiency advantage of the retail chain is large. Table 1 in the main text suggests that stations offering service bays ($GARAGE$=1) and a convenience store ($SHOP$=1) tend to have longer closing hours, while running a car wash ($CARWASH$=1) is related to shorter closing hours. Stations located on highly frequented roads ($TRAFFIC$=1) as well as highway gas stations ($HIGHWAY = 1$) have business hours exceeding those located at less frequented roads; the impact of both variables on closing hours is negative and significantly different from zero. 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); the parameter estimate for *MAJOR* is negative but significantly different from zero in the first model only. Differences in regional characteristics are captured by including dummy variables for eight of the nine provinces in Austria as well as variables measuring potential demand, population density (*POP-DENS*) and the share of commuters (*COMMUTERS*) at the municipality level. High demand should motivate firms to extend opening hours (i.e. to reduce closing hours). We actually find a negative correlation between population density and closing hours; the parameter estimate is significantly different from zero at the 10 %-level (at the 5 %-level) in the first (second) specification. Table 1 suggests a negative relationship between the share of commuters and stations' closing hours, however the parameter estimate for *COMMUTERS* is significantly different from zero at the 10 %-level in the second specification only.

1.2 Descriptive Statistics, Additional Tests and Robustness

Table A1 reports descriptive statistics of all variables used. Results from the first-stage regression and test results for potential violation of the overidentification restrictions are reported in Table A2. The results of a weak instrument robust test for the IV model are reported in Table A3.

Table A4 reports the results of the reduced form maximum likelihood estimation of equation (1) as proposed by Le Sage and Pace (2009). The reduced-form version of the SAR model is $h^* = S^{-1}X\beta + S^{-1}\epsilon$ where $S = I - \rho W$, I is the identity matrix and S^{-1} the spatial multiplier. To account for the fact that similar (unobservable) local characteristics of gasoline stations (spatial correlation in the residuals) could bias our parameter estimate for ρ, we re-estimate the model in a spatial-Durbin framework. The Durbin-Tobit model includes spatial lags of all explanatory variables except the dummies for provinces in addition to the spatial lag of the endogenous variable. Autant-Bernard and LeSage (2011) show that the spatial error model (SEM) is nested in the spatial Durbin model and the effects of spatial correlation in the residuals will thus be adequately taken into account in a spatial Durbin specification. The point estimate for ρ in the Durbin-Tobit model is smaller (apparently, some positive spatial correlation in unobservable variables has been captured by the parameter estimate of ρ in columns (1) and (2)). Again, the presumption of strategic complementarity is clearly rejected; the parameter estimates for ρ in the SAR-Tobit and the Durbin-Tobit model again are not significantly different from zero.

Alternative spatial weights matrices are used for the estimation of IV-models in Tables A5 and A6.

To address the argument that the decision to open full-time (zero closing hours) differs from the choice of the length of closing hours, we estimate a selection model in the tradition of Heckman (1979). Table A7 reports the results of this model. The idea is, that in the first stage firms decide about opening full-time or not and in the second stage, in the case the firms decided against zero closing hours, they make their choice about the length of closing hours. Thus, we have the regression equation $h_1 = \rho_1 W h_1 + X\beta + \epsilon$ and the selection equation $Z\gamma + u > 0$, where h_1 is the length of closing hours and $h_2 = 1$ if the length of closing hours are larger than zero and $h_2 = 0$ otherwise. $\epsilon \sim$ N(0,1) and $u \sim$ N(0,σ) with Corr(u, ϵ)=ρ. We use Neweys two-step estimator for the IV-Probit to estimate the selection equation Pr(h_2|Z)=Φ(Zγ) with $Z =$

$[Wh_2, X]$ and ρ_2 the coefficient of Wh_2. We calculate the inverse Mills' ratio $\phi(Z\widehat{\gamma})/\Phi(Z\widehat{\gamma})$, where ϕ is the normal density. The regression equation with the endogenous Variable Wh_1 as well as the inverse Mills' ratio on the RHS is estimated using GMM. The results support our previous finding. Neither the spatial lag of the independent variables in the selection nor in the regression equation is significantly different from zero. In addition, the coefficient of the inverse Mills' ratio is insignificant too, suggesting that the selection equation does not affect the regression equation.

References

Autant-Bernard, C. and LeSage, J. P. (2011). Quantifying knowledge spillovers using spatial econometric models. 51(3):471–496.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1):pp. 153–161.

Inderst, R. and Irmen, A. (2005). Shopping hours and price competition. *European Economic Review*, 49:1105–1124.

Le Sage, J. and Pace, R. K. (2009). *Introduction to Spatial Econometrics*. Chapman & Hall/CRC, Taylor & Francis Group, Boca Raton, FL.

Shehata, E. A. E. and Mickaiel, S. K. (2013). Sptobitsar: Stata module to estimate Tobit MLE spatial lag cross sections regression.

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Table A1: Summary Statistics

Variable	**Mean**	**(Std. Dev.)**	**Min.**	**Max.**
Closing Hours (h)	6.958	4.327	0	20.000
Distance to next station ($DIST$)	2.335	2.661	0.001	22.649
Size if station in 100 square meters ($SIZE$)	1,762.861	2,173.216	15	40,000.000
Station is company-owned ($COMPANY$)	0.613		0	1
Station has garage ($GARAGE$)	0.440		0	1
Station has shop ($SHOP$)	0.825		0	1
Station has carwash ($CARWASH$)	0.641		0	1
Traffic at location is heavy ($TRAFFIC$)	0.133		0	1
Location on highway ($HIGHWAY$)	0.028		0	1
Minor brand ($MINOR$)	0.324		0	1
Population desitiy of municipality ($POP\text{-}DENS$)	29.772	58.421	0.003	265.320
Ratio of commuters to population ($COMMUTERS$)	0.538	0.218	0.073	0.926
W*Closing Hours (Wh)	6.691	1.719	0.164	13.377

Remarks: The number of observations is 2,646.

Table A2: Results of First-Stage Regression

Explanatory Variables	Coef.	t-stat	
Distance to next station (*DIST*)	-0.007	-0.600	
Size of station in 100 square meters (*SIZE*)	-0.000	-2.040	**
Station is company-owned (*COMPANY*)	-0.041	-0.580	
Station has garage (*GARAGE*)	1.114	1.830	*
Station has shop (*SHOP*)	-0.200	-2.070	**
Station has carwash (*CARWASH*)	0.031	0.410	
Traffic at location is heavy (*TRAFFIC*)	-0.267	-2.670	***
Location on highway (*HIGHWAY*)	0.361	1.880	*
Minor brand (*MINOR*)	0.059	0.600	
Major brand (*MAJOR*)	0.016	0.170	
Population density of municipality (*POP-DENS*)	-0.006	-8.370	***
Ratio of commuters to population (*COMMUTERS*)	-1.043	-4.290	***
W*Distance to next station (*WDIST*)	0.155	3.690	***
W*Size if station in 100 square meters (*WSIZE*)	-0.000	-6.910	***
W*Station is company-owned (*WCOMPANY*)	-1.443	-6.530	***
W*Station has garage (*WGARAGE*)	1.479	8.190	***
W*Station has shop (*WSHOP*)	1.952	5.040	***
W*Station has carwash (*WCARWASH*)	0.456	1.620	
W*Location on highway (*WHIGHWAY*)	-2.525	-4.320	***
W*Minor brand (*WMINOR*)	-0.260	-0.680	
W*Major brand (*WMAJOR*)	-0.550	-1.530	
Dummies for provinces	Yes		
F statistic	58.28		
Amemiya-Lee-Newey minimum chi-sq statistic	8.712		

Remarks: The dependent variable is the product of the spatial weights matrix and the number of hours the station is closed, Wh. All rows of the W matrix are normalized and thus, by construction, W is row-stochastic. Asterisks denote statistical significance in a t-test at 1% (***), 5% (**) or 10%(*) level.

Table A3: Weak Instrument Robust Tests and Confidence Sets for IV-Tobit

Test	**Statistic**	**(p-value)**	**95% Confidence Set**
CLR	0.73	0.3965	[-0.162249, 0.441446]
AR	9.45	0.3971	[-0.317485, 0.579434]
LM	0.72	0.3966	[-0.162249, 0.441446]
Wald	0.79	0.3734	[-0.167793, 0.44699]

Table A4: Results of SAR-Tobit and Durbin-Tobit Model for Stations Closing Hours

	SAR Tobit (1)			Durbin Tobit (2)		
Explanatory Variables	Coef.	t-stat		Coef.	t-stat	
Constant	10.534	38.95	***	10.581	26.94	***
Distance to next station (*DIST*)	0.130	9.30	***	0.096	5.55	***
Size of station in 100 square meters (*SIZE*)	-0.0003	-9.49	***	-0.0003	-9.44	***
Station is company-owned (*COMPANY*)	-0.642	-7.44	***	-0.625	-7.25	***
Station has garage (*GARAGE*)	0.726	9.93	***	0.724	9.89	***
Station has shop (*SHOP*)	-1.246	-8.30	***	-1.216	-8.11	***
Station has carwash (*CARWASH*)	-0.634	-7.06	***	-0.604	-6.74	***
Traffic at location is heavy (*TRAFFIC*)	-0.078	-0.61		-0.084	-0.58	
Location on highway (*HIGHWAY*)	1.067	0.83		1.089	0.87	
Minor brand (*MINOR*)	-0.318	-2.60	***	-0.339	-2.77	***
Major brand (*MAJOR*)	-0.736	-6.35	***	-0.748	-6.41	***
Population density of municipality (*POP-DENS*)	-0.003	-3.05	***	0.001	0.47	
Ratio of commuters to population (*COMMUTERS*)	0.119	0.39		0.214	0.48	
ρ	0.033	1.50		0.009	0.38	
σ	1.609	52.76	***	1.595	52.91	***
Spatial lags of explanatory variables (WX)	No			Yes		
Dummies for provinces	Yes			Yes		
(Pseudo)Log Likelihood	-3807.4021			-3788.3964		

Remarks: The dependent variable is the number of hours the station is closed. Asterisks denote statistical significance in a t-test at 1% (***), 5% (**) or 10%(*) level. The number of observations is 2,646. All rows of the W matrices are normalized and thus, by construction, W is row-stochastic. The Stata-code of Shehata and Mickaiel (2013) is used to estimate the SAR-Tobit and the spatial Durbin-Tobit model.

Table A5: Results of IV-Tobit Estimations with Different Spatial Weights Matrices (1)

	15 Neighbors (km) (1)			15 Neighbors (min^2) (2)			10 Neighbors (min) (3)		
Explanatory Variables	Coef.	t-stat		Coef.	t-stat		Coef.	t-stat	
Constant	4,323	3,54	***	4,662	4,26	***	4,638	3,8	***
Distance to next station (*DIST*)	0,133	3,28	***	0,134	3,05	***	0,134	3,02	***
Size if station in 100 square meters (*SIZE*)	-0.001	-10.15	***	-0,001	-8,25	***	-0,001	-8,29	***
Station is company-owned (*COMPANY*)	-0,745	-3,13	***	-0,746	-3,15	***	-0,747	-3,16	***
Station has garage (*GARAGE*)	1,472	6,93	***	1,471	7,06	***	1,472	7,06	***
Station has shop (*SHOP*)	3,513	11,09	***	3,514	8,62	***	3,509	8,61	***
Station has carwash (*CARWASH*)	-0,435	-1,74	*	-0,432	-1,71	*	-0,429	-1,69	*
Traffic at location is heavy (*TRAFFIC*)	-1,557	-4,4	***	-1,553	-4,33	***	-1,561	-4,35	***
Location on highway (*HIGHWAY*)	-8,529	-7,62	***	-8,542	-5,9	***	-8,553	-5,93	***
Minor brand (*MINOR*)	-0,538	-1,64		-0,539	-1,49		-0,534	-1,48	
Major brand (*MAJOR*)	-0,770	-2,32	**	-0,770	-2,23	**	-0,766	-2,23	**
Population desitiy of municipality (*POP-DENS*)	-0,005	-1,77	*	-0,005	-1,88	*	-0,005	-1,84	*
Ratio of commuters to population (*COMMUTERS*)	-1,387	-1,6		-1,410	-1,67	*	-1,401	-1,64	
ρ	0.134	0.91		0,089	0,69		0,093	0,62	
σ	1,595	93,92	***	1,595	75,71	***	1,595	75,68	***
Dummies for provinces	Yes			Yes			Yes		
Pseudo Log Likelihood	-11679,722			-12533,095			-11821,830		

Remarks: The dependent variable is the number of hours the station is closed. Asterisks denote statistical significance in a t-test at 1% (***), 5% (**) or 10%(*) level. In column (1) (column (2)), w_{ij} is set equal to zero if the j^{th} station is not among the 15 nearest neighbors of i and is set equal to the inverse of the distance in km (the inverse of the squared driving time in minutes) from station i to station j otherwise. In column (3), 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 in minutes from station i to station j otherwise. All rows of the W matrices are normalized and thus, by construction, W is row-stochastic.

Table A6: Results of IV-Tobit Estimations with Different Spatial Weights Matrices (2)

	10 Neighbors (binary) (1)			Radius 20 minutes (2)		
Explanatory Variables	Coef.	t-stat		Coef.	t-stat	
Constant	5,957	4,73	***	4,659	3,49	***
Distance to next station (*DIST*)	0,140	3,13	***	0,147	3,04	***
Size if station in 100 square meters (*SIZE*)	-0,001	-8,38	***	-0,001	-8,32	***
Station is company-owned (*COMPANY*)	-0,754	-3,17	***	-0,771	-3,26	***
Station has garage (*GARAGE*)	1,506	7,24	***	1,463	7,02	***
Station has shop (*SHOP*)	3,473	8,52	***	3,527	8,67	***
Station has carwash (*CARWASH*)	-0,429	-1,69	*	-0,400	-1,58	
Traffic at location is heavy (*TRAFFIC*)	-1,621	-4,52	***	-1,592	-4,48	***
Location on highway (*HIGHWAY*)	-8,556	-5,87	***	-8,520	-5,89	***
Minor brand (*MINOR*)	-0,518	-1,43		-0,564	-1,56	
Major brand (*MAJOR*)	-0,770	-2,23	**	-0,798	-2,33	**
Population desitiy of municipality (*POP-DENS*)	-0,006	-2,24	**	-0,005	-2	**
Ratio of commuters to population (*COMMUTERS*)	-1,669	-1,91	*	-1,554	-1,83	*
ρ	-0,091	-0,59		0,097	0,56	
σ	1,595	75,76	***	1,593	75,55	***
Dummies for provinces	Yes			Yes		
Pseudo Log Likelihood	-11150,226			-11594,283		

Remarks: The dependent variable is the number of hours the station is closed. Asterisks denote statistical significance in a t-test at 1% (***), 5% (**) or 10%(*) level. In column (1), 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 one otherwise. In column (2), w_{ij} is set equal to zero if the j^{th} station is not among the neighbors of i within a radius of 20 minutes driving time and is set equal to one otherwise. All rows of the W matrices are normalized and thus, by construction, W is row-stochastic.

Table A7: Heckman Selection Model for Stations' Closing Hours

	Selection Equaition			Regression		
Explanatory Variables	Coef.	t-stat		Coef.	t-stat	
Constant	0,129	0,33		3,990	2,45	**
Distance to next station (*DIST*)	0,006	0,48		0,128	3,75	***
Size if station in 100 square meters (*SIZE*)	-0,0001	-7,60	***	-0,001	-4,22	***
Station is company-owned (*COMPANY*)	-0,031	-0,43		-0,728	-3,97	***
Station has garage (*GARAGE*)	0,270	4,26	***	1,500	6,48	***
Station has shop (*SHOP*)	1,070	12,36	***	3,546	3,84	***
Station has carwash (*CARWASH*)	0,005	0,07		-0,536	-2,69	***
Traffic at location is heavy (*TRAFFIC*)	-0,468	-4,76	***	-1,584	-3,77	***
Location on highway (*HIGHWAY*)	-1,563	-5,70	***	-6,166	-2,91	***
Minor brand (*MINOR*)	-0,053	-0,56		-0,559	-1,96	**
Major brand (*MAJOR*)	-0,042	-0,43		-0,767	-2,80	***
Population desitiy of municipality (*POP-DENS*)	-0,001	-1,59		-0,004	-2,12	**
Ratio of commuters to population (*COMMUTERS*)	-0,487	-1,86	*	-1,234	-1,69	*
Inverse Mills				2,214	1,29	
ρ_2	0,164	0,37				
ρ_1				0,116	1,00	
Dummies for provinces	Yes			Yes		

Remarks: Asterisks denote statistical significance in a t-test at 1% (***), 5% (**) or 10%(*) level. w_{ij} is set equal to zero if the j^{th} station is not among the 15 nearest neighbors of i and is set equal to the inverse driving distance otherwise.