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Output growth and prices of establishments in the Swedish hotel industry

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Abstract

This paper provides first estimates of the determinants of output growth in the Swedish hotel industry based on the establishment level. Growth of overnight stays is modelled as a function of initial size, age, type of accommodation, hotel prices and region. The empirical model accounts for potential endogeneity of hotel prices through two-stage least absolute deviation models (2SLAD) and the instrumental variable quantile regression method using the control function approach. 2SLAD estimates show that high price establishments show a significantly higher output growth rate between 2005?2010. Growth of establishments is significantly higher for smaller, younger and city hotels and also varies across regions. Furthermore, instrumental variable quantile estimates show that the positive impact of hotel prices on growth increase along the conditional distribution of firm growth. Accommodation prices significantly decrease with the number of local competitors with a non-linear form and increase with size. City hotels and accommodation in the capital city achieve higher prices.

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Keywords: firm growth, establishments, hotel industry, hotel prices, local competition, Sweden.

JEL: D22, L11

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The views expressed here are those of the authors. Data for the analysis have been made available through collaboration within the ESSLAIT project led by Statistics Sweden.

Introduction

The empirical analysis of firm growth is a classical field in industrial economics. Insights into the determinants of firm growth are particularly interesting for mature markets. A typical example of a mature market is the hotel industry in high-income countries, characterised by a high degree of competition and concentration, and declining entry rates (Kalnins, 2006). The industrial economics literature shows that the growth of hotels and other accommodation establishments depends on initial size, age and locational characteristics (Audretsch et al., 2004; Park & Jang 2010; Santarelli, 1998; Piergiovanni et al., 2004). The tourism literature also shows that age and firm size are central determinants of firm growth in the hospitality industry (see Marco, 2012 for 3,600 Spanish hotels and Alonso-Almeida, 2013 for Spanish travel agencies, hotels, and rural accommodations). While age and size are central determinants of long-term firm growth, little is known about the role of prices for growth of hotels. Knowledge of the relationship between prices and firm growth is interesting since high prices generally signal high-quality products and services.

This paper contributes to the literature by providing first empirical evidence on the determinants of output growth and hotel prices in the Swedish hotel industry at the establishment level. Special focus is put on the relationship between hotel prices and firm growth in the next years. Growth of establishments is measured as the average annual change in overnight stays between 2005 and 2010. Other determinants of growth include size, age and type of hotel (e.g., city hotel, hostels, cottages), and location. The empirical model accounts for potential endogeneity of output prices through the estimation of the two-stage least absolute deviation model (2SLAD) with the number of competitors in given municipality as the instrument for prices. In order to allow for heterogeneity of the effects between low and high growth establishments, we use the quantile regression methods. This approach makes it possible to examine the whole distribution of establishment growth through

hotels with rising overnight stays, moderate growth of overnight stays and falling growth. Quantile regression has been frequently used in tourism research (see Chen & Lin 2013; Hung et al., 2010; Lew & Ng 2012; Santos & Vieira, 2012). In order to account for the endogeneity of hotel prices, we employ the control function approach introduced by Lee (2007) with the number of competitors in a given municipality as the instrument for prices.

Sweden is an interesting country case study for the analysis of the growth of hotels. With 29 million overnight stays in hotels and related establishments in 2012, it is a small player in overall hotel overnight stays in Europe. However, growth of overnight stays in hotels between 2000 and 2012 is higher in Sweden than those in Mediterranean countries and other Western European destinations (SE: 2.5, NO: 1.6, CH: 0.2, FI: 1.9, AT: 1.4, ES: 1.4, IT: 0.8, FR: 0.9 percent per year on average).

This paper also contributes to the determinants of prices on the lodging industry. Recent studies show that age, size, location, geographical concentration and share of foreign travellers play a significant role in hotel prices (Becerra, Santaló & Silva, 2013; Hung, Shang, & Wang, 2010). Unlike most previous studies, we employ the total population of establishments in the lodging industry rather than a selected sample of hotels listed in online booking systems.

The key research questions addressed in this paper are as follows: (i) How important are establishment-specific factors - such as age, size, location, type of accommodation, attractiveness for foreign visitors, region and quality (measured as the revenue per visitor nights) - for the growth of visitor nights in establishments? (ii) Are there differences in the determinants between fast and low growing establishments? (iii) What are the main determinants of accommodation prices in the Swedish hotel industry?

The availability of unique establishment data for the total population of the hotel industry for Sweden makes it possible to jointly analyse the determinants of growth of establishments and output prices. The large number of observations makes it possible to model parameter heterogeneity. Data consist of the total population of establishments in the hotel industry of about 2,460 establishments for the period 2005–2010. To the best of our knowledge, this is the first paper to jointly estimate the determinants of growth of visitor nights and prices of accommodation establishments. Growth of establishments is measured as the number of overnight stays, including both domestic and foreign tourists.

The paper is structured as follows: Section two describes the theoretical background and introduces the empirical model, while section three provides the data and descriptive statistics. Section four presents the empirical results, and section five concludes.

Theoretical background and empirical model

The analysis of firm growth is a classic field of research in business, management and economic literature. Growth is an important goal of companies because it serves as a basic indication of success. Gibrat (1931) suggests that a firm's growth is independent of its initial size; the probability of output growth should thus be the same for firms of varying sizes in a given industry (see Sutton, 1997 for an overview). In contrast, empirical studies have shown that firm growth depends significantly negatively on initial size. Other factors include age, location and legal form. The literature for tourism establishments also tends to agree that smaller and younger firms grow faster than their larger and older counterparts (see Park & Kim, 2010; Park & Jang, 2010; Rufin, 2007; Audretsch et al., 2004).

Besides the classical determinants of firm growth, high prices are likely to have a positive impact on firm growth. It is well established that in a competitive market, high prices signal high quality products and services, and low prices reflects low products and services

(Milgrom & Roberts, 1986). For the hotel industry, high average prices reflect the tourist's willingness to pay for high quality hotels. Nayyar (1990) suggests that in a competitive market for service products, high prices signal high-quality services. However, prices depend on a bundle of factors and are likely to be endogenous to firm growth.

Therefore it is not surprising that numerous studies are available which investigate the determinants of prices of hotels and other accommodation establishments. It is well known that hotel prices vary widely, even within cities (Thrane, 2007). The theoretical background of the price equation is based on the hedonic price model, where prices of a product and/or service are a linear function of its attributes (see Papatheodorou, Lei, & Apostolakis, 2012 for a recent survey). Price differences between hotels and other accommodation establishments reflect differences in quality, accommodation specific attributes, location and seasonality (Papatheodorou, Lei, & Apostolakis, 2012 for a survey). Among accommodation specific factors, size and age are commonly regarded as significant determinants of accommodation prices (e.g., Israeli, 2002; Monty & Skidmore 2003; Thrane, 2007). Larger hotels often belong to a hotel chain and are typically more luxurious than smaller ones and thus can achieve higher room rates. For instance, based on a sample of 1,490 Spanish hotels in 2005, Becerra, Santaló and Silva (2013) find that room rates increase with size and age. Room rates are significantly lower in hotels located near beaches and mountains. Hung, Shang and Wang (2010) find that the proportion of foreign travellers has a significant positive impact on room prices.

Furthermore, competition is commonly regarded as an important factor of accommodation prices. Hotels and other accommodation establishments usually face a high degree of competition (Kalnins, 2006). For a given accommodation establishment, competition arises mainly from the same type of hotel but can also occur from other accommodation establishments. Microeconomic theory suggests that more firms in the market leads to greater

competition and lower rents, and thus drives down prices (Kalnins, 2006). However, this only holds true when products are homogeneous. Industrial organization shows that an increase in the degree of market competition leads to lower prices (Bresnahan & Reiss, 1991; Shaked & Sutton, 1982). The seminal study on the relationship between output prices and the size of geographic markets goes back to Bresnahan and Reiss (1991). For retail and professional services, the authors measure the incremental price effects of additional competitors in undifferentiated markets and find that the highest prices arise in markets with one or two firms. Prices are far lower in markets with three or more firms and even lower in markets with more than five firms.

For the hotel industry, the number of local competitors or other market concentration indicators are often used as a measure of competition intensity. This literature also finds that local competition and geographical agglomeration are important determinants of accommodation prices (Baum, & Haveman, 1997; Becerra, Santaló, & Silva, 2013; Balaguer & Pernías, 2013; Fernandez & Marin, 1998; Gan & Hernandez, 2013). Using a sample of 1,490 hotels in 67 distinct locations in Spain, Becerra, Santaló, & Silva (2013) find that the local number of competitors in the same quality category has a significantly negative impact on room rates. However, geographical distance to the nearest competitor is not significantly different from zero. Balaguer and Pernías (2013) find that the presence of an additional close competitor reduces the level of hotel prices by between 0.8 and 1.9 percent. The literature also shows that hotel prices increase when there are fewer competitors with available rooms (Abrate, Fraquelli, & Viglia, 2012). Gan and Hernandez (2013) find that the number of nearby competitors has a significant negative impact on hotel prices, but not on the occupancy rate. The data consist of the numbers for hotels that operated in rural areas across Texas between 2003 and 2005.

The empirical model makes it possible to jointly analyze the determinants of accommodation prices and output growth. Evans (1987) shows that firm growth (*G*) can be described as the function *g* in dependence of firm size and age:

$$G = \frac{S_{t'}}{S_t} = g(S_t A_t),$$

Here, S_t and $S_{t'}$ are the size of a firm in the periods t' and t, respectively, and A is firm age at time *t*. Adding control variables to the basic firm growth model leads to the following specification:

$$\frac{\log(S_{it'}) - \log(S_{it})}{d} = \alpha_0 + \alpha_1 \log S_{it} + \alpha_2 \log S_{it}^2 + \alpha_3 \log A_{it} + \alpha_4 \log(\mathrm{P})_{it} + \alpha_5 \log(\mathrm{S^F/S})_{it}$$
$$\sum_{r=1} b_{ir} \mathrm{TYPE}_{ir} + \sum_{r=1} c_{ir} \mathrm{REG}_{ir} + \varepsilon_{it}.$$

Here, d=t' and *t* stands for the number of years for which visitor nights are measured. In this application, t is 2005 and t' is 2010. The dependent variable measures the average annual growth rate of overnight stays between 2005 and 2010. S denotes the size of establishments measured as the number of overnight stays in the initial year. A is initial age of establishment at the beginning of the period measured as a dummy variable for firms between zero and five years old at the beginning of the estimation period. P denotes average annual revenues per guest nights at the beginning of the period and is an approximation of the output price. S^F/S denotes the initial share of foreign overnight stays and represents a measure of internationalisation. TYPE represents a set of dummy variables measuring the type of hotels and accommodation units with tourist hotels as the reference category. Finally, REG denotes a set of regional dummy variables with the province of Västra Götaland as the reference category.

A typical concern in regressions is potential endogeneity. In this application, hotel prices are likely to be endogenous to firm growth. It is well known that ignoring the potential endogeneity of prices may bias the results of the impact of prices on subsequent firm growth. In order to account for the endogeneity of prices, we use instrumental variable methods. In the first stage, output prices in the initial year are regressed on a number of exogenous variables, including predetermined instruments. Following the literature, hotel prices are modelled as a function of establishment age and size, location, type and geographical concentration:

$$\log(P_{it}) = \beta_0 + \beta_1 \log S_{it} + \beta_3 \log A_{it} + \beta_4 \log(\text{nocomp})_{it} + \beta_4 \log(\text{nocomp})_{\text{it}}^2 + \sum_{r=1} b_{ir} \text{TYPE}_{ir}$$
$$+ \sum_{r=1} c_{ir} \text{REG}_{ir} + v_{it},$$

Here, again the price P is calculated as annual revenue divided by overnight stays, $P_{it} = Y_{it} / S_{it}$ and nocomp denotes the number of establishments within a given municipality of the same type. Alternatively, the number of establishments of all types is used. In order to allow for a non-linear relationship, we included the squared term of the number of local competitors. Alternatively, number of competitors is measured as a dummy variable. The number of local competitors serves as the instrument for prices. Given that the hotel industry belongs to the non-tradable goods sector, the geographical measure comes close to the theoretically appropriate measure of the number of competitors on the product market that is relevant for accommodation establishments.

The first stage price equation can be estimated by OLS. Following the recent literature, the log-linear form is used (Papatheodorou, Lei, & Apostolakis, 2012). The firm growth equation is estimated by the two stage least absolute deviation estimator (2SLAD) introduced by Amemiya (1982). This estimator is the analog to 2SLS in a median regression model consisting of an OLS model in the first stage and the median regression model in the second stage.

The determinants of overnight stays are also estimated by quantile regression techniques. Both OLS and the median regression model provide estimates of the mean effects for the average establishment or at the median value of the conditional distribution of the growth rate. The advantage of quantile regressions is that they provide information about the impact of the independent variable on different points in the conditional distribution of the dependent variable other than the conditional mean (Koenker & Basset, 1978). Here, we use the quantile regression technique to investigate whether growth-quality differs across the specific percentiles (or quantiles) in the conditional distribution of firm growth. It might be the case that the role of quality of accommodation establishments differs between growing and shrinking establishments.

In the quantile regression framework, the price variable is also allowed to be endogenous. For quantiles other than the median, Lee (2007) introduced the quantile IV estimator using the control function approach. The model consists of two equations:

$$Y = X\alpha(\nu) + Z_1^{'}\gamma(\nu) + U$$

$$X = \mu(\tau) + Z^{'}\varpi(\tau) + V$$

where Y is firm growth rate, X is hotel prices, which is assumed to be endogenous. Z and Z_1 denote vectors of explanatory variables, U and V are unobserved random variables and μ is an unknown parameter to be estimated. In order to identify the model, it is assumed that at least one variable of Z_1 is significant, but not included in Z. Possible endogeneity is accounted for by adding the residual power series of the first stage regions as additional control variables.

The estimation of the determinants of firm growth has to deal with the survivor bias. During the period 2005–2010, 10 percent of the accommodation units disappeared from the sample due to closures or other reasons. In order to account for sample selection in quantile regressions, we use Heckman's sample selection model.

Data and descriptive statistics

Data is drawn from the total population of establishments in Sweden for the period 2005–2010. This contain information on the number of overnight stays for domestic and foreign visitors, number of domestic and foreign arrivals, and revenues on a yearly basis. In addition, the database provides information on the zip code, location (municipality), region (see Figure A2 in the appendix for a map) and the type of accommodation establishments classified as city hotels, tourist hotels, cottages or hostels. A municipality denotes the smallest of administrative regions in Sweden. Given the availability of the total population of establishments, we measure the level of competition by the number of accommodation establishments at the municipality level of the same type or of all types. There are 290 municipalities in Sweden and 23 provinces. For the sample period 2005–2010, information on 2,460 establishments is available.

Table 1 reports summary statistics for the estimation sample. The descriptive statistics show that the average annual growth rate of overnight stays is 1.5 percent between 2005 2010. The number of overnight stays in 2005 is 5,463 on average, and revenues per guest night are at about 765 SEK in 2005 (equal to 82 euro giving the exchange rate in 2005). The average number of establishments in a given municipality is 24 and the median is 15. When the number of local competitors is restricted to accommodations of the same type, the number of local establishments decreases to 12. As expected, the highest number of establishments can be found in Stockholm with 134 followed by Gotland with 72, and both Göteborg and Åre

with 62 each. About 24 percent of the hotels are between zero and five years old at the beginning of the period. Concerning the type of hotel, city and tourist hotels account for the bulk of accommodation establishments with 37 and 31 percent, respectively.

Table 1: Descriptive statistics

	mean	standard deviation
average annual growth of overnight stays 2005–2010	0.0156	0.119
number of guest nights in 2005	5463	11825
revenue per guest nights (SEK) in 2005	765	466
number of local competitors, all types in 2005	24	30
number of local competitors, same types in 2005	12	22
Percentage of municipalities with 15 competitors and more	0.16	
Percentage of young hotels	0.24	
type of accommodation:		
hostels and other	0.23	
city hotel	0.37	
cottages	0.10	
tourist hotel	0.31	

	Provinces		
	Percentages		Percentages
Blekinge	0.022	Södermanland	0.027
Dalarna	0.070	Stockholm	0.121
Gävleborg	0.032	Uppsala	0.021
Gotland	0.024	Värmland	0.044
Halland	0.029	Västerbotten	0.038
Jämtland	0.058	Västernorrland	0.031
Jönköping	0.040	Västmanland	0.019
Kalmar	0.048	Västra Götaland	0.120
Kronoberg	0.023	Örebro	0.024
Norrbotten	0.051	Östergötland	0.044
Skåne	0.114		

Source: Source: Swedish Agency for Economic and Regional Growth and Statistics Sweden

The highest number of hotels and other accommodation establishments can be found in Stockholm (12.1 percent) followed by Västra Götaland (12 percent) and two winter sport regions, namely, Dalarna (7.0 percent) and Jämtland (5.8 percent). Figure A3 in the appendix provides kernel density estimates of the growth rate. The normal distribution seems to be a good approximation of the data.

Empirical results

As a first step, we check for the possible survivor bias by using the Heckman selection model. The probability of surviving is modelled as a function of the number of local competitors, market concentration (measured by the Herfindahl-Hirschman index) in terms of revenues, regional dummy variables, and age and size. All variables are measured at the beginning of the period where market concentration and competition indicators are used as identifying variables. Unreported results show that the inverse Mills ratio is not significant at conventional significance levels, indicating that the problem of sample selection is unimportant for the sample of Swedish hotels and other accommodation establishments.

As a next step, we provide OLS estimates of the first stage regression with the logarithm of hotel prices in 2005 as the dependent variable (see table 2). Three specifications are provided: one with the log number of local competitors limited to the same type of hotel and its squared term allowing for a non-linear relationship. The second and third specification uses a dummy variable equal to one when the number of local competitors is 15 and more where the latter dummy variable is based on all types of hotels.

Standard errors are adjusted for possible correlation within municipalities in order to avoid the downward bias in estimated standard errors of the local competition variable. The R^2 is 0.71 indicating that more than two thirds of the variation of hotel prices can be explained by the model. The coefficients of the predetermined instruments are significant at the one percent level. In particular, the Wald test shows that the number of local competitors in 2005 and its squared term are jointly significant at the one percent level. The relationship between prices and the number of competitors is non-linear. An increase in the number of local competitors leads to an increase in hotel prices until a threshold of 12 competitors but turns to be negative as the number of competitors increase (see Figure A4 in the appendix). When competition is measured by a dummy variable, we find that hotel prices are 10 percent lower when the

number of local competitors is 15 or higher. When the number of competitors in a given municipality covers all types of hotels, we find a coefficient of -0.05, indicating that hotel prices are five percent lower in municipalities with a higher number of competitors.

Table 2: OLS estimates of the determinants of log revenues per guest nights of accommodation establishments in 2005

	(i)			(ii)			(iii)		
	Coef.		t	Coef.		t	Coef.		t
log number of local competitors in the same category, 2005	0.05	*	2.03						
log number of local competitors in the same category squared 2005	-0.02	***	-2.99						
15 and more local competitors in same category, 2005				-0.10	***	-3.43			
15 and more local competitors in all categories, 2005							-0.05	***	-2.87
log guest nights	0.04	***	5.85	0.04	***	6.24	0.04	***	6.08
dummy young firms (0-5 years)	-0.03		-1.46	-0.03		-1.47	-0.03		-1.53
tourist hotels (benchmark hostels)	1.12	***	39.79	1.12	***	40.29	1.12	***	38.53
city hotel	1.20	***	51.76	1.19	***	51.54	1.18	***	50.20
cottages	0.03		0.81	0.03		0.71	0.02		0.62
Blekinge (ref. category Västra Götaland)	-0.13	***	-3.18	-0.12	***	-3.11	-0.10	***	-2.69
Dalarna	-0.18	***	-3.71	-0.18	***	-3.68	-0.14	***	-3.20
Gävleborg	-0.06		-1.61	-0.06		-1.57	-0.05		-1.27
Gotland	-0.12	***	-4.71	-0.08	***	-2.95	-0.10	***	-3.93
Halland	-0.06		-1.74	-0.06	*	-1.72	-0.03		-0.76
Jämtland	-0.14	***	-3.84	-0.11	***	-3.23	-0.12	***	-3.51
Jönköping	0.02		0.41	0.03		0.70	0.03		0.76
Kalmar	-0.12	***	-3.26	-0.13	***	-3.32	-0.09	**	-2.28
Kronoberg	-0.10		-1.53	-0.10		-1.57	-0.08		-1.06
Norrbotten	0.06		1.05	0.05		1.05	0.08		1.59
Skåne	-0.01		-0.26	0.00		-0.02	0.02		0.44
Södermanland	0.07		1.19	0.07		1.23	0.08		1.59
Stockholm	0.31	***	8.72	0.30	***	9.17	0.29	***	7.79
Uppsala	0.18	**	2.34	0.18	**	2.30	0.20	**	2.69
Värmland	-0.12	**	-2.50	-0.11	**	-2.21	-0.09	**	-2.08
Västerbotten	-0.13	**	-2.07	-0.13	**	-2.11	-0.09		-1.49
Västernorrland	-0.07	**	-2.02	-0.07	**	-1.95	-0.02		-0.66
Västmanland	0.07		0.98	0.06		0.82	0.08		1.15
Örebro	-0.01		-0.23	0.00		-0.02	0.00		-0.08
Östergötland	0.01		0.37	0.01		0.23	0.04		0.93
constant	5.35	***	109.65	5.37	***	114.24	5.38	***	113.13
Adjusted R^2	0.71			0.71			0.71		
# of observations	2463			2463			2463		

Notes: *p<0.1, ** p<0.05, ***p<0.01. Standard errors are cluster-adjusted for 282 municipalities for which data is available.

Furthermore, accommodation prices are highest in the capital city, namely, Stockholm, followed by Uppsala. Specifically, prices are 36 percent and 20 percent higher than the

reference region of Västra Götaland (calculated by exp(ß)-1 X 100 where ß is the coefficient). Accommodation prices are significantly lower in Jämtland and Dalarna which are the main winter sport destinations in Sweden (see Figure A2 in the appendix for a map). Besides the regional dummy variables and number of local competitors, size measured as the number of overnight stays and type of accommodation is significant. In particular, size of the establishments is significantly positively related to average accommodation prices. Among the different types of accommodations, city and tourist hotels achieve the highest price with a price premium of more than 200 percent as compared to hostels.

Table 3 shows the median regression and 2SLAD parameter estimates of the determinants of average annual growth of visitor nights between 2005 and 2010 at the establishment level. The instruments for output prices passed the Sargan's test of over-identification (with p-value >0.10). Furthermore, unreported results show that growth of overnight stays is independent of the number of local competitors, indicating the validity of the instruments. Overall, the instruments passed all three tests of statistical correlation.

The Pseudo R^2 value is 0.05 for 2SLAD estimates. This is in line with the firm growth literature showing that the determinants of firm growth usually explain only a small proportion of observed growth (Geroski, 2000). The key parameter of interest is annual revenues per overnight stays at the beginning period, which is an indicator not only of the price level but also of the service quality of hotels. Estimates obtained from 2SLAD show that hotel prices have a positive and significant impact on the average annual growth of overnight stays between 2005 and 2010. The magnitude of the impact of price effect is quite large: An increase in hotel output prices of 10 percent leads to increase in the average annual growth rate of 0.13 percentage points between 2005 and 2010. Furthermore, growth of overnight stays of establishment depends significantly on initial size, age, type of accommodation and location. In particular, the growth rate of overnight stays is significantly higher for city hotels

than that of other types of hotels. On average, city hotels have a 2.2 percentage points higher growth rate of overnight stays based on 2SLAD estimates. This is consistent with the worldwide growth of urban tourism, including business tourism (Law, 2002; Matland & Ritchie 2009).

Table 3: Determinants of growth of overnight stays at the establishment level between 2005 and 2010

	LAD			2SLAD		
	coef.		t	coef.		t
log overnight stays 2005	-0.095	***	-5.45	-0.096	***	-5.42
log overnight stays 2005 squared	0.005	***	5.29	0.005	***	5.05
young firms (0-5 years)	0.015	***	3.62	0.012	**	2.55
log revenues per guest nights 2005	0.013	***	4.17			
pred. log revenues per guest nights 2005				0.013	***	3.13
city hotels	0.020	***	4.55	0.022	***	5.05
Blekinge (ref. cat. Västra Götaland)	0.001		0.11	-0.003		-0.31
Dalarna	0.005		0.69	0.006		0.84
Gävleborg	0.015	***	2.99	0.016	**	1.96
Gotland	0.029	***	3.91	0.029	***	3.03
Halland	0.009		1.40	0.008		1.15
Jämtland	-0.021	**	-2.50	-0.023	***	-3.11
Jönköping	0.003		0.32	0.004		0.37
Kalmar	0.013		1.06	0.011		1.24
Kronoberg	-0.027	***	-2.89	-0.035	***	-2.97
Norrbotten	0.023	***	2.75	0.020	**	2.53
Skåne	0.008		1.46	0.007		1.29
Södermanland	0.016	*	1.67	0.019	*	1.94
Stockholm	0.003		0.65	0.004		0.62
Uppsala	0.015		1.16	0.011		1.04
Värmland	0.012	**	2.14	0.013		1.38
Västerbotten	0.011		0.67	0.006		0.44
Västernorrland	-0.013		-0.98	-0.016		-1.01
Västmanland	0.014		1.18	0.020	**	2.23
Örebro	-0.005		-0.34	-0.006		-0.46
Östergötland	0.002		0.19	0.003		0.28
constant	0.331	***	4.32	0.337	***	4.81
Pseudo R^2	0.054			0.053		
number of observations	2463			2463		

Notes: $^{*}p<0.1$, $^{**}p<0.05$, $^{***}p<0.01$ based on two tailed t-test. LAD and 2SLAD estimates are based on bootstrapped standard with 100 replications. The first stage price regression is based on specification ii displayed in Table 2.

The coefficient on hotel size is negative and its squared term is positive and significant, indicating a non-linear relationship where the negative dependence of the growth rate on initial size slows as hotel size increases. This leads to a rejection of Gibrat's law. The average effect of initial size is -0.05 calculated as the median of overnight stays. This means that an

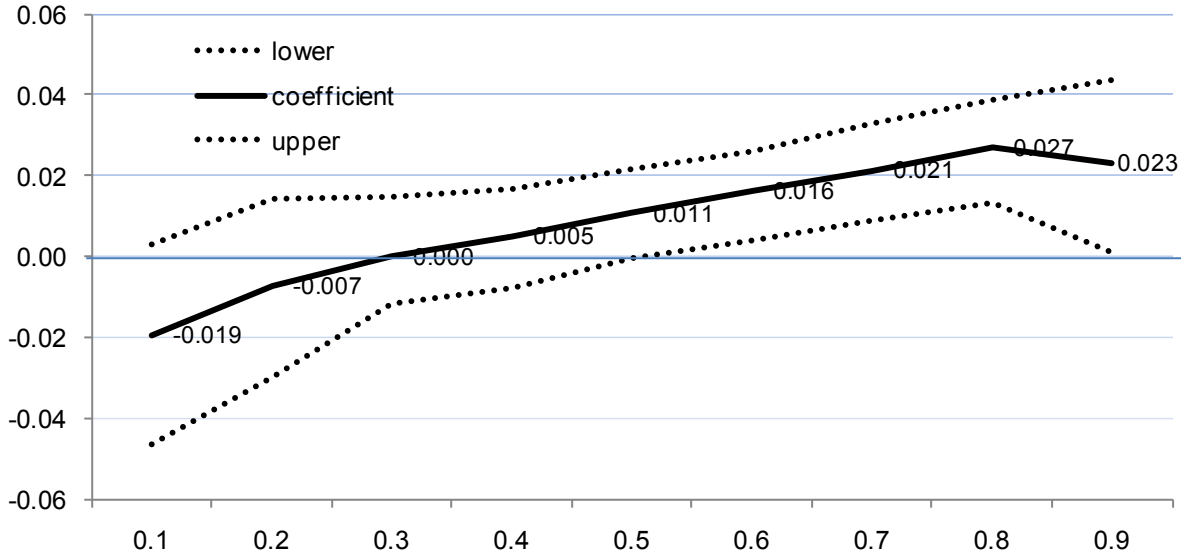
increase in establishment size by 10 per cent is associated with a fall in the average annual growth rate of overnight stays by 0.5 percentage points. Furthermore, younger establishments have a higher average growth rate of about 1.2 percentage points per year. There are also significant differences in the growth rate of overnight stays across regions. While Gotland (summer destination) and Norrbotten (Sweden's northernmost province) receive a higher than average growth of overnight stays, Jämtland (winter sport destination) receive a significantly lower than average growth rate of overnight stays.

Table 4 contains the coefficients of the growth equation estimated by the quantile instrumental variable estimator based on the control function approach for nine different percentiles (10th to 90th percentile).[1] The table also contains the 95% confidence interval. The results shows that the price variable increases in magnitude and significance when moving from the lower to the higher quantiles (see also Figure 1). In particular, the hotel price variable is positive and statistically significant for the top quantiles (60th to the 90th percentiles) but insignificant for the lower percentiles. This indicates that the position in the higher price quality segment is only relevant for accommodation establishments with higher than average growth rates. As a sensitivity check, we have also estimated the two stage quantile regression method which is analogous to the 2SLAD approach introduced by Amemiya (1982). Figure A3 plots the coefficients of the price variable at the different conditional quantiles together with the 95 percent confidence interval. The results again show that the impact of hotel prices on growth of overnight stays increases when moving from the low to the top quantiles.

Furthermore, we find that hotels located in cities have a significantly higher growth rate of visitor nights as compared to other hotels at each of the quantiles. Young hotels grow significantly faster with slightly larger effects in the higher percentiles.

[1] The Stata module CQIV with the uncensored option developed by Chernozhukov et al., (2012).is used to estimate the quantile IV model.

Figure 1: Impact of predicted accommodation prices on output growth across different percentiles



Notes: Coefficients and confidence interval are based using the control function approach by Lee (2007). The dashed line represents the 95% confidence interval based on 100 bootstrapped draws.

Table 4: Quantile instrumental variable estimates of the determinants of growth of overnight stays at the establishment level between 2005 and 2010

		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
pred. log revenues per night stays 2005	coef.	-0.019	-0.007	0.000	0.005	0.011	0.016	0.021	0.027	0.023
	lower	-0.046	-0.030	-0.012	-0.008	0.000	0.004	0.009	0.013	0.001
	upper	0.003	0.014	0.015	0.017	0.021	0.026	0.033	0.039	0.044
log night stays 2005	coef.	-0.036	-0.039	-0.063	-0.084	-0.107	-0.133	-0.145	-0.177	-0.240
	lower	-0.095	-0.087	-0.104	-0.124	-0.156	-0.175	-0.199	-0.258	-0.322
	upper	0.012	0.006	-0.007	-0.029	-0.062	-0.084	-0.106	-0.104	-0.172
log night stays 2005 squared	coef.	0.003	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.012
	lower	0.000	0.000	0.001	0.002	0.003	0.004	0.005	0.005	0.008
	upper	0.007	0.005	0.006	0.007	0.009	0.010	0.011	0.014	0.017
young establishments	coef.	0.018	0.022	0.019	0.015	0.015	0.023	0.030	0.027	0.025
	lower	-0.010	0.000	0.008	0.004	0.003	0.007	0.013	0.003	0.001
	upper	0.047	0.042	0.032	0.029	0.038	0.042	0.046	0.053	0.052
city hotels	coef.	0.049	0.035	0.033	0.029	0.023	0.019	0.020	0.024	0.032
	lower	0.027	0.006	0.017	0.013	0.007	0.004	0.004	0.002	0.006
	upper	0.072	0.061	0.052	0.043	0.037	0.033	0.035	0.039	0.046
constant	coef.	0.112	0.115	0.220	0.304	0.389	0.483	0.529	0.675	1.044
	lower	-0.093	-0.074	-0.039	0.102	0.220	0.285	0.377	0.373	0.660
	upper	0.340	0.366	0.421	0.474	0.616	0.687	0.773	1.031	1.404
predicted residuals	coef.	0.040	0.021	0.008	-0.002	-0.008	-0.016	-0.022	-0.030	-0.029
	lower	0.015	-0.011	-0.011	-0.019	-0.028	-0.035	-0.043	-0.049	-0.065
	upper	0.076	0.057	0.025	0.016	0.013	0.004	-0.002	-0.003	-0.001

Notes: Quantile IV estimates are calculated using the uncensored option in the CQIV Stata command using a parametric version of the estimator proposed by Lee (2007) and an OLS first stage. Standard errors are bootstrapped with 100 replications.

Conclusions

In this study we have investigated the determinants of growth of overnight stays in the Swedish accommodation industry using establishment data. Special emphasis was put on the link between hotel prices and output growth where prices are assumed to be endogenous. Empirical results based on the 2 stage least absolute deviation estimator showed that the growth rate of overnight stays is significantly higher for high end hotels than that of budget hotels and other accommodation establishments in lower price segments. Specifically, a 10 percent higher hotel price leads to a 0.13 percentage points higher output growth rate in the next five years, on average. Using quantile IV estimates, we found that the impact of hotel prices on growth increases when moving the lower to the higher quantiles. In addition, city hotels show a significantly higher growth rate of overnight stays as compared with other types of accommodation establishments, which is consistent with the worldwide rise of urban and business tourism. Furthermore, as expected, firm growth is higher for younger and smaller firms. Evidence based on the first stage price regression estimated by OLS showed that hotel prices decrease with the number of competitors in the same municipality upon a threshold of 12 accommodation units and are significantly higher for hotels located in the capital city and generally for larger hotels.

A potential limitation of the study is the absence of technological and organisational innovations. It is well known that technological and organisational innovations are important drivers of growth of hotels (Hjalager, 2010; Orfila-Sintes et al., 2005). However, for smaller hotels, information on technology use is not available based on official data.

One implication of the findings is that establishments in the hotel industry could achieve a higher growth rate if they were to increase their product and service quality, making it possible to charge higher prices. This strategy is particularly effective for high growth hotels.

There are several avenues for future research. One idea is to model the relationship between hotel prices and exit of hotels. It is likely that hotels in the lower price segment have a higher failure risk than high price hotels. Another idea is to account for spatial dependence in the price and firm growth equation. It is likely that prices and the output growth of accommodations are influenced by the pricing decision and performance of the neighbouring accommodation. The data set makes it possible to identify hotels in neighbouring postal codes.

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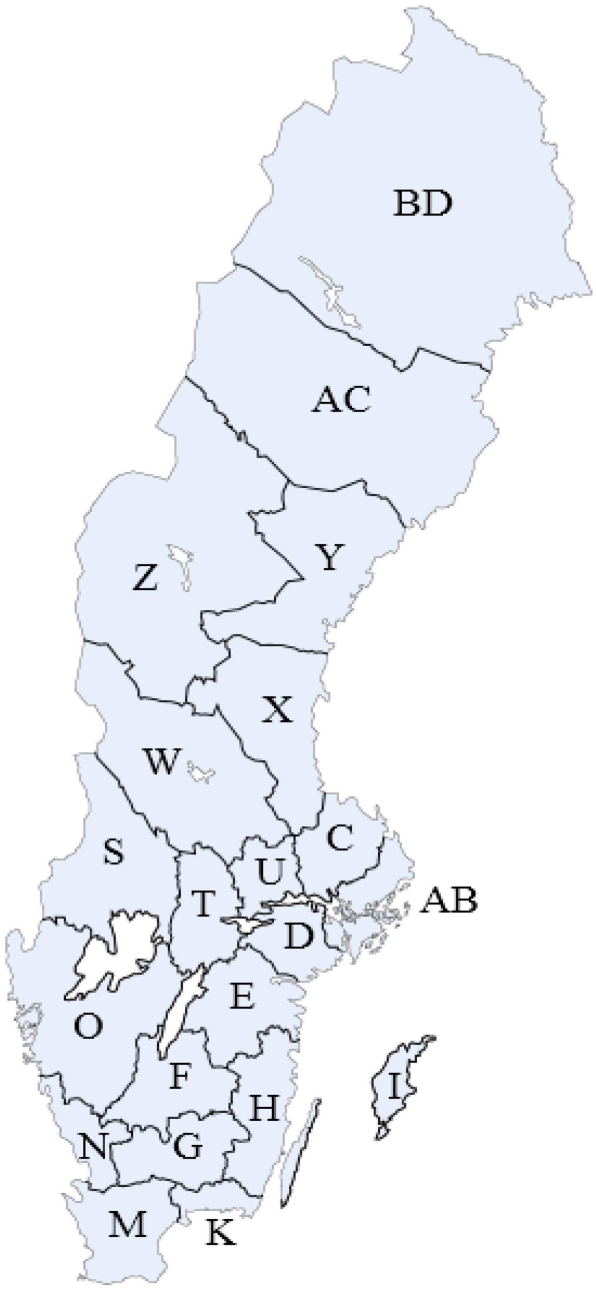
Appendix *Figure A2: Map of Sweden*



County (län)	County code	County (län)	County code
Stockholms län	AB	Hallands län	N
Västerbottens län	AC	Västra Götalands län	O
Norrbottens län	BD	Värmlands län	S
Uppsala län	C	Örebro län	T
Södermanlands län	D	Västmanlands län	U
Östergötlands län	E	Dalarnas län	W
Jönköpings län	F	Gävleborgs län	X
Kronobergs län	G	Västernorrlands län	Y
Kalmar län	H	Jämtlands län	Z
Gotlands län	I	Skåne län	M
Blekinge län	K		

Figure A3: Distribution of output growth rates

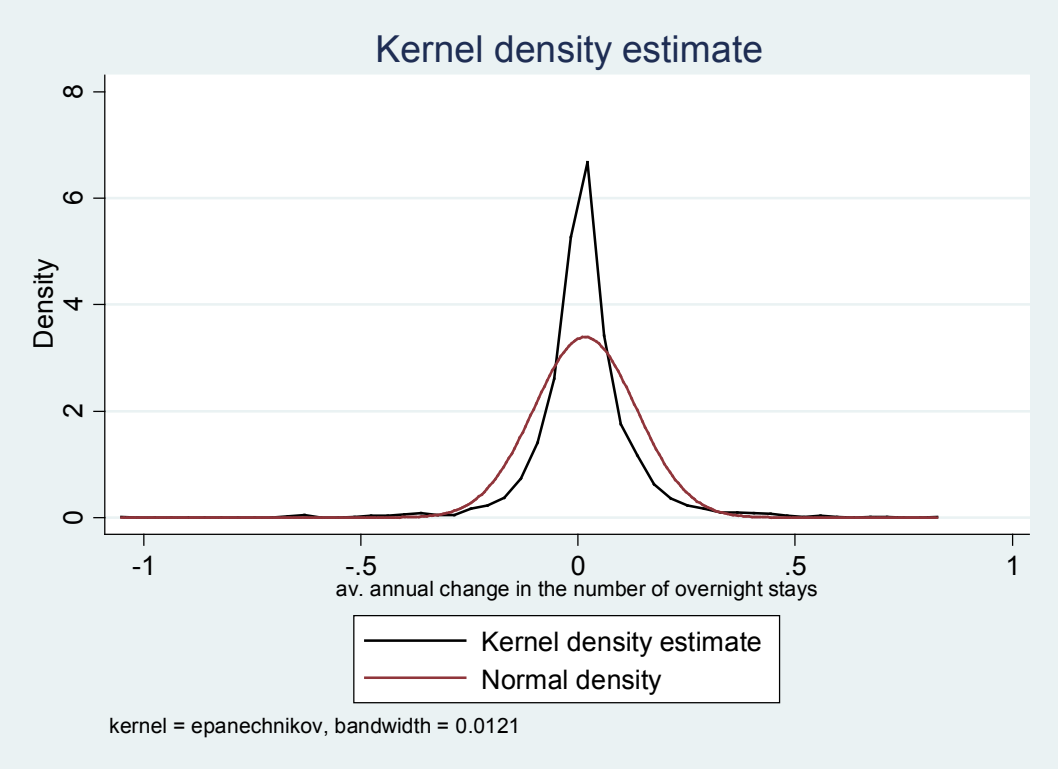
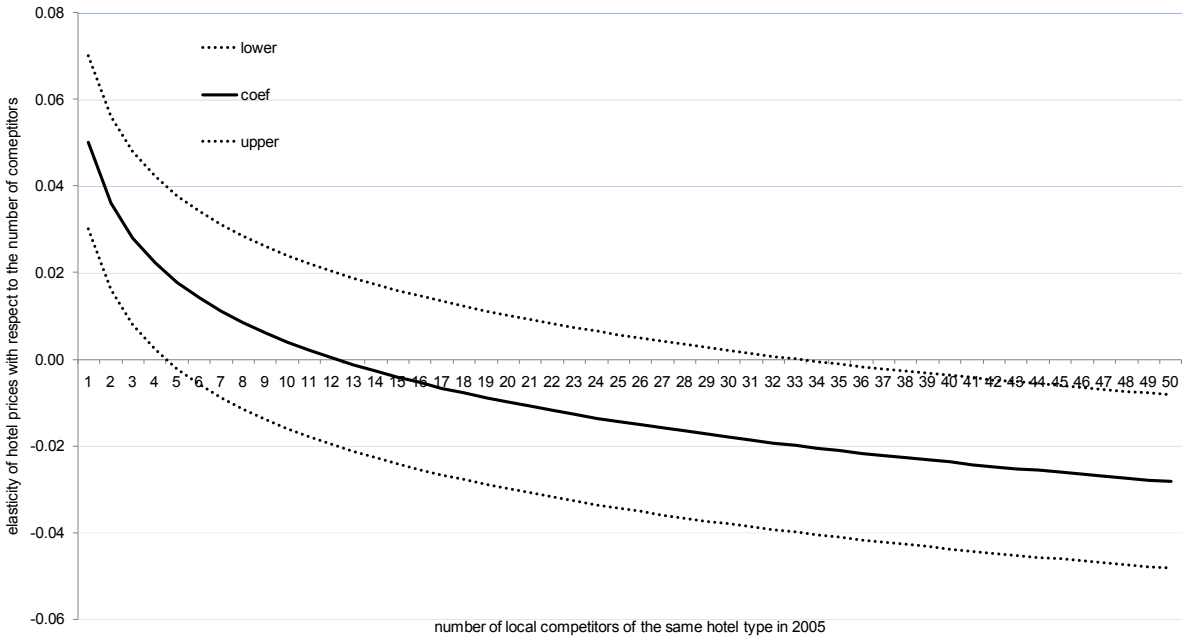
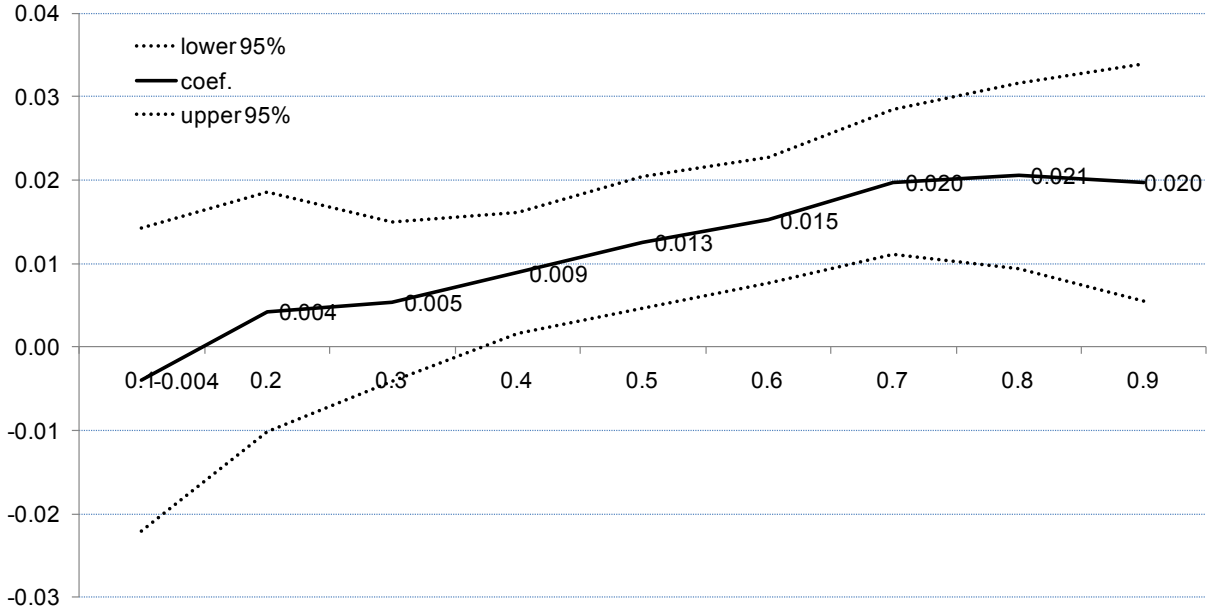


Figure A4: Impact of the number of local competitor on accommodation prices



Notes: The elasticity of hotel prices with respect to the number of coefficient is calculated based on specification i in Table 1.

Figure A5: Impact of predicted prices on output growth across different percentiles



Notes: Coefficients and confidence interval are based using the two stage quantile regression by Amemiya (1982). The dashed line represents the 95% confidence interval based on 100 bootstrapped draws.