

Road Pricing and Retail Revenues: Results from the Stockholm Road Pricing Trial

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Abstract

This paper studies the impact of the Stockholm road pricing trial on retail revenues. The analysis is performed using revenue data from 14 shopping malls, 9 within the toll area and 5 outside the toll area. The data also include revenue data from a sample of retail stores located along the main shopping streets in Stockholm. The results show that the Stockholm road pricing trial did not negatively affect retail revenue, neither in shopping malls nor in the sample of retail stores.

Key Words: Road toll, congestion fee, congestion charge, retail revenues, retail profits.

JEL classification: D12, H31, L81

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1 Introduction

Congestion is a large and increasing problem in a number of cities around the world. In order to come to terms with this problem some cities (e.g., London and Stockholm) have recently introduced congestion charges. One potential drawback, however, is that congestion charges can have a negative impact on the retail businesses within the toll areas.

The literature concerning the effects of congestion charges on the retail trade sector in these cities is scarce. Notable exceptions are Smidfeldt-Rosqvist et al (2006), Windsor-Cundell (2003) and Quddus et al (2005). Smidfeldt-Rosqvist et al (2006) study the effects of the Stockholm road pricing trial on travel patterns, and their results show that total travel decreased by approximately 10 percent and travel for shopping purposes decreased by 17 percent during the hours when the fee was charged. It should, however, be noted that total travel for shopping purposes need not be that severely affected since consumers can adapt to the road pricing trial by doing their shopping during the hours when no fee is being charged. Windsor-Cundell (2003) report the results from a survey by the London Chamber of Commerce and Industry and the results from this survey showed that 76 percent of the respondents reported reduced revenues year-by-year, and that this was to a large extent blamed on the introduction of the congestion charge in London in February 2003. Quddus et al (2005) study the effects on total retail sales, as well as on John Lewis sales data from six stores in the London area, of the introduction of congestion charges in London. Their results indicate that there seems to have been a statistically significant impact on

sales on John Lewis Oxford Street, while no statistically significant impact could be found on the retail sector as a whole.

The purpose of this paper is to study whether the Stockholm road pricing trial affected retail revenues negatively for shopping malls and stores located within the toll area. Compared to Quddus et al (2005), we have access to a more comprehensive dataset, including shopping malls located both within and outside the toll area, as well as time periods before, during and after the Stockholm road pricing trial. As such, we adopt an intervention-control approach (explained in detail below) in order to investigate the effects of the road pricing trial on retail revenues. The results are in line with Quddus et al (2005) regarding the impact of the London congestion fee on the retail sector as a whole. As such, the results show that the Stockholm road pricing trial had no statistically significant negative effects on retail revenues during the trial period for the shopping malls located within the toll area as compared to the control group of shopping malls located outside the toll area.

The paper is organized as follows: In the next section the Stockholm road pricing trial is described in detail, and the expected impact on retail revenues is discussed. Section 3 contains the empirical analysis. In this section, the data are presented and the empirical method is described in detail. In addition, this section also presents the results from the empirical analysis. Finally, in section 4, a discussion concludes this paper.

2 The Stockholm road pricing trial

The Stockholm road pricing trial started January 3, 2006 and ended July 31, 2006. The main purpose of the trial was to reduce congestion, and a specific target of reducing traffic by 10-15 percent during rush hours was set for the trial. As such, the congestion fee was differentiated depending on what time one choose to enter the zone where the congestion fee was being charged. The highest fee was set to 20 SEK for the time period 7.30 until 7.59 in the morning, and the period 16.00 to 16.29 in the evening.¹ During the non-rush hours of the day, 9.00 until 15.29, a fee of 10 SEK was charged. No fee was charged during weekends, and the maximum fee per car and day was 60 SEK. Exemptions from the congestion fee were made for environmentally friendly vehicles, vehicles owned by disabled drivers, motorcycles, taxis, buses and other essential vehicles (military vehicles, police, etc).

What can be expected regarding the road pricing trial when it comes to the impact on retail revenues? Car-borne shoppers can choose to pay the fee and do their shopping during the hours when the fee was charged. As mentioned above, Smidfeldt-Rosqvist et al (2006) study the effects of the Stockholm road pricing trial and show that travel for shopping purposes decreased by 17 percent during the hours when the fee was charged. This need not, however, reduce retail revenues since car-borne shoppers can choose to do fewer trips, but spend larger amounts on each trip in order to minimize the impact of the congestion fee.

Alternatively, car-borne shoppers can choose to adopt to the congestion

¹1 EURO is equal to 9.32 SEK, exchange rate 2007-07-31.

fee by changing their destinations, their mode of travel or their time of travel. If car-borne shoppers choose to change their destination, this will lead to an impact on retail revenues for shopping malls and stores located within the zone. However, changing the mode of travel or the time of travel does not necessarily reduce retail revenues. In Sweden, where most retail trade establishments are open late in the evenings and on weekends, there are ample opportunities for car-borne shoppers to adopt to the congestion fee by changing the time of travel for shopping purposes to periods when no fee is being charged. If so, one would not expect any impact of the road pricing trial on retail revenues. It should, however, be noted that an increase in shopping during evenings and weekends might also increase the cost of labor, and thus impact the profit rather than the revenues of the retail trade sector within the congestion fee zone. Unfortunately, the available data does not allow us to investigate this issue any further.

3 Empirical analysis

In this study, we use monthly data on revenues from 14 shopping malls within the Stockholm region (9 located within the toll area and 5 located outside the toll area) together with one aggregated revenue measure from a sample shops located in the inner city of Stockholm. The data were collected by The Swedish Retail Institute (HUI) and cover the period from January 2004 until December 2006. Data have thus been collected both before, during and after the intervention period for all shopping malls included in this study. Descriptive statistics for the sample are presented in Table 1.

Table 1 about here

In order to estimate the impact of road pricing on the retail revenues, we adopt an intervention-control approach. Our intervention group are the 9 shopping malls and the sample of stores from the large shopping streets located within the Stockholm toll area during the period the trial lasted. Our control group, on the other hand, consists of 5 other shopping malls located 5 kilometers or more outside the toll area, but still within the general Stockholm region, as well as the malls located within the toll area during the periods when the trial was not implemented. We have chosen to exclude 3 shopping malls located within 5 kilometers from the toll area in order to reduce the risk of spillover effects, i.e. that the malls located close to the toll area increased their revenues because of the road pricing trial.²

The empirical model to be estimated can be written:

$$\ln R_{it} = \alpha_i + \alpha_t + \beta S_{it} + \varepsilon_{it}, \quad (1)$$

where R_{it} measures the revenue for shopping mall i in month t in SEK³, α_i is a shopping mall specific fixed effect capturing time invariant heterogeneity between shopping malls (i.e. location, opening hours if unchanged,

²The estimation of equation (1) below has also been performed including the 3 shopping malls located closely outside to the toll area. Including these malls does not change the qualitative results in any of the estimated models. In addition, equation (1) has also been estimated for each of the three malls located closely outside the toll area. The results show that there has been some increase in revenue for one of the shopping malls, Sickla. However, extensive remodelling of this shopping mall had been completed just before the introduction of the Stockholm road pricing trial, and it is difficult to empirically discriminate between the effects of the remodeling and the effects of the road pricing trial on revenues. The results from these estimations are available from the authors on request.

³ R_{it} is deflated using the Swedish consumer price index with January 2004 as the base period.

etc), and α_t is a time specific fixed effect capturing time variant heterogeneity (i.e., seasonal variation, business cycle movements, time trends in retail revenues, etc) among shopping malls.

The effect of the Stockholm road pricing trial period is captured by the indicator variable S_{it} , taking the value one during the trial period for the shopping malls located within the toll area and zero otherwise. Hence, the effect of the Stockholm road pricing trial period on retail revenues for shopping malls located within the toll area are compared to the retail revenues of these shopping malls before and after the trial period, as well as to the retail revenues of a control group of shopping malls not affected by the Stockholm road pricing trial. If revenues for shopping malls located within the toll area decreased as an effect of the road pricing trial, we expect β to be negative and statistically significant. Finally, ε_{it} is a random error term assumed to have zero mean and constant variance.⁴

First, equation (1) was estimated using the complete panel data set consisting of the 9 shopping malls and the sample of stores located within the toll area and the 5 shopping malls located more than 5 kilometers outside the toll area. This gives us an estimate of the influence of the Stockholm road pricing trial on total retail revenues inside the toll area (see table 2, all shopping malls). Second, in order to also study heterogeneity in the Stockholm road pricing trial among the shopping malls and stores located within the toll area, the estimations were also performed separately, comparing each shopping mall and the sample of stores located within the toll area to

⁴Initial estimations of equation (1) revealed first-order serial correlation in the error terms. Therefore, equation (1) was re-estimated using a Prais-Winsten (1954) estimator with White (1980) heteroskedasticity robust standard errors.

the five shopping malls located outside. This provides us with information whether the Stockholm road pricing trial affected revenues for any specific shopping mall or the sample of stores located within the toll area.

The results from the estimation of equation (1) regarding the impact of the Stockholm road pricing trial on retail revenues, β , is presented in Table 2 along with its 95 percent confidence interval.⁵

Table 2 about here

According to the results presented in Table 2, the Stockholm road pricing trial had no statistically significant effect on retail revenues. This result is also found when the data is disaggregated in order to study possible heterogeneity in the effects of the trial among the shopping malls located within the toll area.

4 Discussion

The purpose of this paper was to investigate whether the introduction of road pricing in Stockholm decreased revenues for shopping malls and shops located within the toll area. The results from this study indicate that the introduction of the congestion fee did not affect retail revenues for shopping malls or stores located within the toll area. The reason for this is probably that most stores and shopping malls are open in evenings and on weekends in Sweden, making it easy to avoid the congestion fee by changing

⁵The parameter estimates for the time and shopping mall specific fixed effects have been suppressed in order to save space, but are available from the authors on request.

the time when the shopping is being done. Another possibility is that people to a larger extent uses public transport for shopping trips. As parking fees are quite expensive in the Stockholm city, it is also likely that car-borne shoppers are high-income earners that are less sensitive to change their shopping behavior when congestion charges are introduced. Finally, it should be emphasized that the retail businesses might be affected negatively by the introduction of congestion charges eventhough or results does not support this view. It is, for example, possible that shopping behavior primarily is determined by habits that changes slowly and that the Stockholm road pricing trial period was to short to capture any effect on retail revenues inside the toll area.

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Table 1: Monthly revenues (tkr) inside and outside the toll area before, during and after the trial period

<i>Period</i>	<i>Inside toll area</i>	<i>Outside toll area</i>
	Mean (Std Err)	Mean (Std Err)
Before trial period	113577 (12448)	87359 (3363)
During trial period	110483 (22284)	82083 (5240)
After trial period	139574 (32054)	108814 (10241)

Table 2: Estimation results, impacts of the Stockholm road pricing trail on retail revenues inside the toll area.

<i>Shopping mall</i>	<i>Estimate of β</i>		<i>95% C.I.</i>	<i>NOBS</i>
PUB	-0.063	-0.218	0.092	216
NK	0.055	-0.071	0.181	216
Åhlens city	-0.022	-0.090	0.046	216
Västermalmsgallerian	0.074	-0.051	0.199	216
Ringengallerian	0.068	-0.049	0.185	216
Fältöversten	0.002	-0.102	0.107	216
Åhlens Skanstull	-0.125	-0.296	0.046	216
Debenhams	0.033	-0.103	0.169	216
Gallerian	0.065	-0.013	0.144	216
Selection of shops	0.091	-0.042	0.223	216
All shopping malls	0.025	-0.032	0.081	540

Note: NOBS is the number of observations in the estimation of equation (1).