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## Impact of non-smoking ordinances on hospitality revenues: The case of Germany

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GABRIEL AHLFELDT / WOLFGANG MAENNIG

IMPACT OF NON-SMOKING ORDINANCES  
ON HOSPITALITY REVENUES:  
THE CASE OF GERMANY



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# Impact of Non-smoking Ordinances on Hospitality Revenues: The Case of Germany\*

**Abstract:** Non-smoking ordinances are among the most popular albeit controversial public health-care legislations worldwide. This article provides an empirical assessment of the impact of non-smoking ordinances on bar and restaurant revenues in German Federal States. By application of panel spline regression and difference-in-difference strategies, we find negative impact limited to bars in the very short run. If any, there is a positive impact on total expenditures in the long run, indicating that either consumption pattern has not changed at all or that any reduction in spending by smokers is compensated for by a corresponding increase by non-smokers. These findings support the German – and similar – non-smoking legislations in the sense that positive externalities resulting from reduced health care cost are likely to outweigh the risk to businesses in the hospitality sector, at least in the long run.

*Keywords:* Bar Revenues, Non-smoking Ordinances, Restaurant Revenues

*JEL classification:* I18, K32

*Version:* June 2009

## 1 Introduction

Non-smoking ordinances for public spaces in general and bars and restaurants in particular are among the most frequently applied and controversially discussed public health initiatives worldwide. The rationale on which these ordinances has been built is straightforward – they aim at reducing the exposure of non-smokers to secondhand smoke and, hence, their susceptibility to respiratory and heart diseases, and ultimately a reduction in health care costs. This argument applies to bar and restaurant visitors and particularly to employees, who might be less free in choice than customers or patrons. Furthermore, the empirical literature suggests smoking bans to reduce the overall consumption of tobacco products (PAK-KO, 2006), which cause significant social costs estimated at 0.1%-1.1% of GDP (LIGHTWOOD *et al.*, 2000). In contrast to increasing taxation of tobacco products,

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the impact of smoking bans cannot be neutralized by an increase in smuggling of tobacco products. In terms of traditional welfare economics, this argument is sometimes questioned since, in principle, and given the respective demand from non-smokers, markets should be able to provide smoke-free spaces in bars and restaurants without the intervention of the state. Critics of non-smoking ordinances argue that undesirable loss of choice will result in reduced bar and restaurant revenues. This criticism implies the assumption that the decrease in expenditure of smokers would be greater than the increase in expenditure of non-smokers. However, this is a purely empirical issue and can hardly be affirmed on the basis of existing empirical evidence concentrated on the U.S.<sup>1</sup> To our knowledge, this study is the first multivariate empirical analysis of economic impact of a non-smoking ordinance in Europe.

We extend the literature on the impact of (non-)smoking ordinances on bar and restaurant revenues by providing new evidence based on the German smoke-free bar and restaurant ordinance implemented by the 16 German Federal States between autumn 2007 and the beginning of 2008. Using a spline regression panel approach, we distinguish between short-run and long-run impact, which may run in opposite directions. We exploit the fact that the new legislation was introduced by states at different dates as a key feature of our analysis. This particularity facilitates the first application of a quasi-experimental difference-in-difference (DD) strategy in the realm of smoking ban literature, allowing for more efficient control for macroeconomic conditions compared to previous studies.

## 2 Background

### 2.1 Literature Survey

The economic impact of non-smoking ordinances on the gastronomy, mainly in the U.S., has been investigated on the basis of survey data (ADDA, BERLINSKI, & MACHIN, 2007; DUNHAM & MARLOW, 2000, 2003) as well as official statistics.

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<sup>1</sup> See e.g. COWLING & BOND (2005) and PARKER & CHANG (2007); for evidence from outside the U.S., see BLECHER (2006), EDWARDS *et. al.* (2008) and EVANS (2005).

Although some of the latter employ ARIMA-models (e.g. STOLZENBERG & D'ALESSIO, 2007), the literature is dominated by analyses based on multivariate regressions. These studies have frequently made use of employment data (ADAMS & COTTI, 2007; ALPERT *et al.*, 2007; THOMPSON *et al.*, 2008). Less common indicators include purchasing prices of restaurants (ALAMAR & GLANTZ, 2004) tourism demand (GLANTZ & CHARLESWORTH, 1999) or non-economic indicators like air quality (ALPERT *et al.*, 2007). SCOLLO & LAL (2008) provide an extensive survey on these strands of research.

In this analysis we make use bar and restaurant revenues, which have also been frequently employed in the literature. Only few of the newer studies, however, reveal a significantly negative impact of non-smoking ordinance on bar and restaurant revenues,<sup>2</sup> among these PAKKO (2007) and COWLING & BOND (2005) for California (USA) and EVANS (2005) for Canada. Some studies instead provide evidence for (weakly) positive impacts, e.g. BLECHER (2006) for South-Africa, DAI *et al.* (2004) for Florida (USA), EDWARDS *et al.* (2008) for New-Zeeland or PARKER & CHIANG (2007) for California (USA) while others do not find any significant impact at all (e.g. ALPERT *et al.*, 2007).

## 2.2 Non-Smoking Ordinances in German Federal States

After the voluntary agreement to improve the non-smoking protection for guests and employees in the hospitality industry between the *German Hotel and Restaurant Association* and the *German Federal Ministry of Health and Social Security*, dated 1 March 2005 (BUNDESMINISTERIUM FÜR GESUNDHEIT UND SOZIALE SICHERUNG/DEUTSCHER HOTEL UND GASTSTÄTTENVERBAND, 2005), failed in spring 2007 (BUNDESMINISTERIUM FÜR GESUNDHEIT, 2007), Germany implemented statutory smoking bans for the first time in autumn 2007. The first smoking bans entered into force in the federal states of Baden-Württemberg and Lower Saxony on 1 August 2007 and in Hesse on 1 October 2007. With the excep-

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<sup>2</sup> Studies on the impact on bar and restaurant revenues that were published before 2000, include GLANTZ & SMITH (1994, 1997) and SCIACCA & RATLIFF (1998), among others.

tion of the states North-Rhine Westphalia, Rhineland Palatinate, Saarland, Saxony and Thuringia, where smoking bans became effective only in February 2008, or July 2008 in the case of Thuringia, the remaining states implemented their smoking bans as of 1 January 2008.

Non-smoking laws primarily impose a smoking ban on restaurants, but do allow for the set-up of separate "smoking rooms". Only Bavaria banned smoking from restaurants without any exceptions whatsoever. In Saarland, and in Saxony since 1 March 2008, smoking is permitted not only in smoking rooms, but also in owner-operated restaurants without employees. Discothèques, defined as restaurants (*Gaststätten*) under section 1 of the German Restaurants Act (GastG), are also subject to the smoking ban. In the states Baden-Württemberg, Brandenburg, Saxony and Saxony-Anhalt, however, smoking rooms are not permitted. Bavaria's smoking ban in this context does not allow for any exceptions. Party tents or marquees are exempt from the smoking ban in some states.

In its decision on 30 July 2008, Germany's Federal Constitutional Court (BVerfG) found, regarding constitutional challenges brought against the smoking bans in Baden-Württemberg and Berlin by operators of restaurants and discothèques, that the state regulations violated the complainants' fundamental right to pursue a trade under Art. 12 I GG (German Basic Law). Furthermore, the court found that it violated the principle of equality under Art. 3 GG if licensed smoking rooms in restaurants were banned from discothèques (cf. BVerfG, 1 BvR 3262/07 dated 30 July 2008).

However, the decision did not void these regulations. Instead, they continue to remain in force until a constitutional revision of the regulations—which must be completed by 31 December 2009—with the proviso that restaurants shall be exempted that do not have smoking rooms; that do not serve prepared food; that have a guest area of less than 75 sq. m.; that do not admit persons under the age of 18; and that are classified as a "smoking restaurant". In addition, smoking rooms shall be permitted in discothèques if such rooms are also permitted in restaurants (cf. BVerfG, 1 BvR 3262/07 dated 30 July 2008, para. 161 ff.).

Even though the decision referred only to the regulations in the states of Baden-Württemberg and Berlin, almost all other states have since applied the corresponding laws subject to the conditions set by the Federal Constitutional Court. One exception is Rhineland-Palatinate, where similar modifications have been in force since the smoking ban came into effect on 15 February 2008 (cf. Administrative Court [VGH] decision VGH Rhineland-Palatinate, VGH A 32/07, etc. dated 11 August 2008, as well as the decision VGH Rhineland-Palatinate, VGH B 31/07, etc. dated 30 September 2008). In Saxony-Anhalt, however, the conditions set by the Federal Constitutional Court have been applied only since the end of October 2008 (cf. decision of State Administrative Court [LGV] of Saxony-Anhalt, LVG 3/08, etc. dated 22 October 2008). In Bavaria, the smoking ban remains in effect without any exceptions, which is to be considered constitutional according to the reasoning of the Federal Constitutional Court (cf. BVerfG, 1 BvR 3162/07 dated 30 July 2008, para. 121: "On the basis of the latitude that must be afforded the legislator, it would not be prevented [...] from imposing a strict smoking ban in restaurants."). In Saarland, the Protection of Non-Smokers Act continues to apply unchanged, which provides for exceptions for micro-enterprises and also allows for smoking rooms in discothèques. The respective state regulations are shown in Table A1 (see appendix).

### 3 Empirical Analyses

Throughout our empirical analyses we investigate the evolution of per capita revenues ( $RPC_{it}$ ) in the hospitality sector at the levels of months ( $t$ ) and German Federal States ( $i$ ). Besides total revenues, revenues of bars (including discos und dancing halls) and restaurants (including cafes, ice cream parlors and snack bars) are considered individually. Data are retrieved from the monthly survey in the hospitality sector conducted by the German Federal Statistical Office (*Monatserhebung im Gastgewerbe*). The survey is based on a random sample of businesses with annual revenues exceeding €50,000, covering 8% of all businesses (STATISTISCHES BUNDESAMT, 2008a, p. 6). Data are analyzed within a panel framework that allows for unobserved time-invariant effects ( $f_i$ ). Our empirical specifications test



for a significant percentage impact on the revenues of the smoking ban legislation. As a control for macroeconomic conditions, which affect income levels and willingness to spend money in bars or restaurants, we add the rate of unemployment ( $unemp_{it}$ ). Potential seasonality is accounted for by a set of quarterly dummy variables ( $SD_t$ ). Our final specification, allowing for level shifts as well as a linear spline, reads as follows:

$$\log(RPC_{it}) = \alpha + SD_t a + \beta unemp_{it} + \gamma_1 ban_{it} + \gamma_2 ban_{it} \times strend_{it} + trend_t + f_i + \varepsilon_{it} \quad (1)$$

where  $ban_{it}$  is a dummy variable indicating whenever a smoking ban was in operation in state  $i$ ;  $trend_t$  is a quarterly trend variable starting at the beginning of our observation period; and  $strend_{it}$  is a trend variable similar to  $trend_t$  that starts at the time the smoking ban was put into operation in state  $i$ .<sup>3</sup> Parameters  $a$ ,  $\alpha$ , and  $\beta$  as well as  $\gamma_1$  and  $\gamma_2$  are the coefficients to be estimated while  $\varepsilon_{it}$  is a random error term component. Serial autocorrelation, which we detected using the Lagrange multiplier (LM) test for serial correlation in a fixed effects model (BALTAGI, 2001, pp. 94-95)<sup>4</sup> is addressed by clustering standard errors at the state level (BERTRAND, DUFLO, & MULLAINATHAN, 2004). In the present specification, the percentage impact on revenues in the first month of a smoking ban being in operation can be inferred from coefficient  $\gamma_1$ .<sup>5</sup> In contrast,  $\gamma_2$  is the percentage change in revenues after the first month of operation, conditional on other factors, and can indicate either an effect of recovery, amplification or persistency. A number of alterations to specification (1) are tested using either per capita revenues of the total hospitality sector (Table 1) or per capita revenues of bars (Table 2) and restaurants (Table 3) as an endogenous variable.

<sup>3</sup> See GREENE (2003, pp. 121-122) and MARSH & CORMIER (2001), among others, for background on how to set up spline regression models.

<sup>4</sup> The LM test statistic is  $LM_5 = \sqrt{NT^2/(T-1)}(\tilde{v}'\tilde{v}_{-1}/\tilde{v}'\tilde{v})$ ; asymptotically distributed as  $N(0,1)$ .

<sup>5</sup> According to the standard interpretation of a semi-log model, the percentage impact corresponds to  $\exp(b-1) \times 100$ , where  $b$  is the estimated coefficient value (HALVORSEN & PALMQUIST, 1980).

At the first stage of the empirical analysis we consider a reduced model specification where the interactive term  $ban_{it} \times strend_{it}$  is omitted. This specification provides a test for a significant shift in average per capita revenues between the periods prior to and after implementation of the smoking ban (columns 1). No significant impact on revenues is evident from the results. Therefore, we modify the column (1) specification to facilitate separate estimates on short-run (at three months) and long-run impact (after three months) (columns 2). Similarly, in columns (3) we distinguish between periods when a rigid or more attenuated (non-)smoking legislation was in operation, following the decision of the Federal Constitutional Court (BVerfG). On the basis of the coefficient estimates on the dummy variables  $sban_{it}$  (short-run effect),  $lban_{it}$  (long-run effect),  $rban_{it}$  (rigid ban) and  $wban_{it}$  (weak ban) displayed in columns (2) and (3), we cannot reject that the smoking ban had no impact on the per capita consumption in the hospitality sector. If any, there are signs of a small increase in per capita bar revenues of about 3.8% three months after smoking ban implementation, indicated by the weakly significant coefficient on  $lban_{it}$  in Table 2. No significant effects are found for restaurant revenues.

It might be argued that consumer behavior changes gradually since expectation of the benefit from going out are not adjusted for immediately. In the next step, we therefore turn our attention to whether there is evidence for a significant impact on trends in revenues. Building on specification (1) and omitting  $ban_{it}$ , the column (4) specification tests for a linear spline occurring in the evolution of per capita revenues after implementation of the new legislation. Empirical results, again, do not allow rejection of the hypothesis of no impact on revenues. Finally, we estimate specification (1) which allows both for a level shift that accounts for an immediate reaction as well as a trend impact capturing gradual adjustment processes. Potentially, this specification may isolate opposing short- and long-run influences, i.e. a negative impact in the short-run, accompanied by a subsequent recovery effect. Indeed, we find a significantly positive impact on total per capita revenues of 0.5% per month while the coefficient on the short-run intercept ( $ban_{it}$ ) is not statistically significant at conventional levels. For restaurants and

bars individually, no significant impact can be asserted, even on the basis of this quite flexible specification.

Notably, a significant downward trend is found in per capita consumption, accompanied by the expected negative impact of the rate of unemployment. Seasonality effects are similarly in line with expectations, pointing to significantly reduced (increased) per capita revenues in the winter (summer) months of roughly 10% (Table 1). While these results are similarly obtained for restaurant revenues (Table 3), per capita bar revenues are less influenced by long-run trend, macroeconomic conditions and the summer spending effect.

**Tab. 1 Impact on Per Capita Bar and Restaurant Revenues**

	(1)	(2)	(3)	(4)	(5)
<i>trend</i>	-0.0097** (0.0043)	-0.0100** (0.0044)	-0.0100** (0.0043)	-0.0107** (0.0044)	-0.0104** (0.0045)
<i>SD</i> <sub>(Jan-March)</sub>	-0.0936*** (0.0309)	-0.0912** (0.0317)	-0.0935*** (0.0311)	-0.0922** (0.0318)	-0.0895** (0.0319)
<i>SD</i> <sub>(April-June)</sub>	0.0721** (0.0310)	0.0704** (0.0299)	0.0722** (0.0312)	0.0695** (0.0303)	0.0707** (0.0306)
<i>SD</i> <sub>(July-Sept)</sub>	0.115** (0.0488)	0.114** (0.0478)	0.115** (0.0483)	0.110** (0.0473)	0.110** (0.0474)
<i>unemp</i>	-0.0676** (0.0266)	-0.0688** (0.0267)	-0.0677** (0.0267)	-0.0709** (0.027)	-0.0706** (0.0272)
<i>ban</i>	0.0083 (0.0132)				-0.0173 (0.0114)
<i>sban</i>		-0.0024 (0.0142)			
<i>lban</i>		0.0177 (0.0192)			
<i>rban</i>			0.0078 (0.0133)		
<i>wban</i>			0.0125 (0.0199)		
<i>ban × trend</i>				0.0040 (0.0024)	0.0055** (0.0023)
Obs.	528	528	528	528	528
R <sup>2</sup> (within)	0.547	0.548	0.547	0.549	0.55

Notes: The endogenous variable is the log of the per capita bar and restaurant revenues in all models. All models include state (Bundesländer) effects. Standard errors are robust for heteroscedasticity and clustered at the state (Bundesländer) level. \*, \*\* and \*\*\* denote significance at the 10, 5, and 1 percent levels, respectively.

**Tab. 2 Impact on Per Capita Bar Revenues**

	(1)	(2)	(3)	(4)	(5)
<i>trend</i>	-0.0047 (0.0030)	-0.0053* (0.0029)	-0.0048 (0.0030)	-0.0050 (0.0032)	-0.0051 (0.0032)
<i>SD</i> <sub>(Jan-March)</sub>	-0.154*** (0.0295)	-0.149*** (0.0284)	-0.153*** (0.0296)	-0.150*** (0.0306)	-0.152*** (0.0299)
<i>SD</i> <sub>(April-June)</sub>	-0.0477* (0.0243)	-0.0509* (0.0243)	-0.0471* (0.0242)	-0.0479* (0.0241)	-0.0484* (0.0243)
<i>SD</i> <sub>(July-Sept)</sub>	-0.028 (0.0341)	-0.0313 (0.0339)	-0.0305 (0.0346)	-0.0311 (0.0347)	-0.0309 (0.0346)
<i>unemp</i>	-0.00693 (0.0205)	-0.00908 (0.0197)	-0.00721 (0.0205)	-0.00824 (0.0212)	-0.00838 (0.0211)
<i>ban</i>	0.0205 (0.0192)				0.00785 (0.0227)
<i>sban</i>		0.0007 (0.0232)			
<i>lban</i>		0.0383* (0.0206)			
<i>rban</i>			0.0184 (0.0192)		
<i>wban</i>			0.0387 (0.0311)		
<i>ban × trend</i>				0.0035 (0.0028)	0.0027 (0.0034)
Obs.	528	528	528	528	528
R <sup>2</sup> (within)	0.22	0.225	0.221	0.221	0.221

Notes: The endogenous variable is the log of the per capita bar revenues in all models. All models include state (Bundesländer) effects. Standard errors are robust for heteroscedasticity and clustered at the state (Bundesländer) level. \*, \*\* and \*\*\* denote significance at the 10, 5, and 1 percent levels, respectively.

**Tab. 3 Impact on Per capita Restaurant Revenues**

	(1)	(2)	(3)	(4)	(5)
<i>trend</i>	-0.0066** (0.0030)	-0.0065* (0.0031)	-0.0065** (0.0030)	-0.0072** (0.0030)	-0.0070** (0.0030)
<i>SD</i> <sub>(Jan-March)</sub>	-0.115*** (0.0242)	-0.115*** (0.0246)	-0.115*** (0.0243)	-0.114*** (0.0247)	-0.112*** (0.0246)
<i>SD</i> <sub>(April-June)</sub>	0.0331 (0.0236)	0.0335 (0.0231)	0.0326 (0.0238)	0.0315 (0.0233)	0.0324 (0.0233)
<i>SD</i> <sub>(July-Sept)</sub>	0.0753* (0.0358)	0.0757** (0.0353)	0.0773** (0.0358)	0.0723* (0.0350)	0.0719* (0.0351)
<i>unemp</i>	-0.0395** (0.0184)	-0.0392* (0.0187)	-0.0393* (0.0186)	-0.0414** (0.0185)	-0.0412** (0.0186)
<i>ban</i>	0.0031 (0.0086)				-0.0115 (0.0124)
<i>sban</i>		0.0056 (0.0112)			
<i>lban</i>		0.00083 (0.0129)			
<i>rban</i>			0.0048 (0.0089)		
<i>wban</i>			-0.0112 (0.0135)		
<i>ban × trend</i>				0.0021 (0.0019)	0.0031 (0.0025)
Obs.	528	528	528	528	528
R <sup>2</sup> (within)	0.526	0.526	0.526	0.527	0.527

Notes: The endogenous variable is the log of the per capita restaurant revenues in all models. All models include state (Bundesländer) effects. Standard errors are robust for heteroscedasticity and clustered at the state (Bundesländer) level. \*, \*\* and \*\*\* denote significance at the 10, 5, and 1 percent levels, respectively.

The federal states did not put into operation smoking bans at the same time. Smoking bans started as early as August 2007 in the states of Baden-Wuerttemberg and Lower Saxony. Hesse followed two months later in October 2007. We can, therefore, explicitly exploit the period prior to January 1<sup>st</sup>, 2008 – when smoking bans were also implemented in most of the other states, to assess how revenues changed in reaction to smoking ban legislation in comparison to states where no similar intervention occurred. The unaffected states may serve as a control group in a quasi-experimental research strategy. We use simple DD specification to estimate our coefficients of interest, i.e.  $\gamma_1$  and  $\gamma_2$ . The DD specification is derived from specification (1) by taking differences and substituting the macroeconomic controls (quarterly dummies and *unemp<sub>it</sub>*) by a full set of monthly

time effects  $d_t$ .<sup>6</sup> Coefficients  $\gamma_1$  and  $\gamma_2$  in equation (2) provide DD estimates in the sense that they differentiate the evolution of per capita revenues both between groups (affected and not-affected by smoking legislation) and time (prior to and after the intervention). Besides adjusting flexibly to macroeconomic conditions, this specification features the possibility of allowing the intervention to occur at different points in time within different states. Since after 1 January 2008, smoking bans were in operation in all states we omit this period from the sample in the respective estimates. Compared to specification (1), the DD estimator is more promising in identifying short-run impacts, due to better macroeconomic control, while the reduced post intervention period complicates inference on long-run trend impacts.

$$\begin{aligned} \log(RPC_{it}) - \log(RPC_{it-1}) = & \alpha + d_t + \gamma_1(ban_{it} - ban_{it-1}) \\ & + \gamma_2 (ban_{it} \times strend_{it} - ban_{it-1} \times strend_{it-1}) + \varepsilon_{it} - \varepsilon_{it-1} \quad (2) \end{aligned}$$

Results corresponding to equation (2) are presented in Table 4 for total revenues (columns 1 and 4) as well as revenues of bars (columns 2 and 5) and restaurants (columns 3 and 6). All but coefficient  $\gamma_1$  in the case of bar revenues remain statistically insignificant at conventional levels.

As shown by FLECK & HANSSSEN (2008), it is crucial to control appropriately for trends in order to precisely assess the intervention effect of smoking bans to avoid spurious evidence. Since there is the possibility of trends not being homogenous across states, we re-estimate equation (2) in a (state) fixed effects model, which in time-difference form captures trend effects at the state level (Table 4, columns 3-6). Results, however, remain almost unchanged, again pointing to a significantly negative impact on per capita consumption in bars of approximately 6%. Since the respective coefficients on  $\gamma_2$  are insignificant, we cannot reject persistency of the effect during the months following the implementation of the smoking ban. We note that our estimated short-run

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<sup>6</sup> Similar DD specifications that regress the growth rate of the endogenous variable on a full set of time effects and interaction dummies have recently been employed by AHLFELDT & MAENNIG (2009) and REDDING & STURM (2008).

treatment effect points to an almost twice as high reduction of bar revenues compared to the effects revealed by descriptive evidence in an analysis by the German Statistical office (STATISTISCHES BUNDESAMT, 2008b).<sup>7</sup>

**Tab. 4 Difference-in-Difference Estimates**

	(1) (bars & restaurants)	(2) (bars)	(3) (restaurants)	(4) (bars & restaurants)	(5) (bars)	(6) (restaurants)
$\Delta ban$	-0.0314 (0.0422)	-0.0596** (0.0214)	-0.0169 (0.0236)	-0.0306 (0.0427)	-0.0602** (0.0213)	-0.0162 (0.0241)
$\Delta ban \times trend$	0.00472 (0.0223)	0.0179 (0.0153)	-0.0023 (0.0166)	0.0059 (0.0256)	0.0214 (0.0190)	-0.0035 (0.0204)
FE	-	-	-	Yes	Yes	Yes
Obs.	368	368	368	368	368	368
R <sup>2</sup> (within)	0.638	0.606	0.772	0.639	0.607	0.772

Notes: The endogenous variable is the log of per capita revenues of bars and restaurants, bars or restaurants. Standard errors are robust for heteroscedasticity and clustered at the state (Bundesländer) level. \*, \*\* and \*\*\* denote significance at the 10, 5, and 1 percent levels, respectively.

## 4 Conclusion

This paper investigates the impact of the German smoking ban legislation on per capita revenues of bars and restaurants. In addition to panel regression, we conducted a DD approach to analyze significant impact immediately following the new legislation, as well as on post-intervention trends. Based on our panel regression analyses, we cannot affirm a negative impact on revenues in line with existing literature. If any, our spline models indicate a positive influence of the smoking bans on revenues. Our DD results, which exploit the distinct dates of implementation in the states, providing a better control for the overall macroeconomic conditions, instead point to a significantly negative short-run impact on the revenues of bars but not restaurants. In sum, our results draw a picture of limited negative short-run impact, followed by a recovery effect. Over the course of our study period, the consumption pattern either did not change at all or reduced

<sup>7</sup> Comparing the reduction in revenues in the third quarter of 2007 to that of the previous year, the statistical office finds a 9.8% reduction in states which introduced smoking bans compared to a 6.8% reduction in states without smoking-ban legislation.

spending by smokers was compensated for by a corresponding or more than corresponding increase by non-smokers. These findings support the German – and similar – non-smoking legislations in the sense that positive externalities resulting from initiatives to reduce health care cost are likely to outweigh the risk to businesses in the hospitality sector, at least in the long run.

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**Table A1: Smoking bans in German states**

State	Legal basis of smoking ban	Regulation for hospitality industry prior to BVerfG decision					Regulation after BVerfG decision
		Entry into effect	Smoking room allowed	Smoking ban in micro-enterprises	Smoking ban in party tents	Smoking ban in discothèques	
Baden-Württemberg	State Non-Smokers Protection Act (LNRSchG) dated 25.7.2007	1.8.2007	+	+	-	+ (smoking room not allowed)	Exceptions under conditions of BVerfG
Bavaria	Health Protection Act (GSG) dated 20.12.2007	1.1.2008	-	+	+ (but not allowed from 22.7.2008 to 31.12.2008)	+ (smoking room not allowed)	No changes
Berlin	Protection from the Dangers of Passive Smoking in Public Act (Non-Smokers Protection Act - NRSG) dated 8.11.2007	1.1.2008	+	+	+ (if restaurant under B7 s. 1 GastG)	+ (smoking room not allowed)	Exceptions under conditions of BVerfG
Brandenburg	Protection from the Dangers of Passive Smoking in Public Act (Non-Smokers Protection Act of Brandenburg - BgbNiRSchG) dated 18.12.2007	1.1.2008	+	+	+ (if restaurant under s. 1 GastG)	+ (smoking room not allowed)	Exceptions under conditions of BVerfG
Bremen	Non-Smokers Protection Act of Bremen (Brem-NiSchG) dated 18.12.2007	1.1.2008	+	+	- (for certain fairs and festivals)	+ (Smoking room allowed)	Exceptions under conditions of BVerfG
Hamburg	Protection from the Dangers of Passive Smoking in Public Act (Non-Smokers Protection Act of Hamburg - HmbPSchG) dated 11.7.2007	1.1.2008	+	+	- (events limited in time and space as well as club houses)	+ (Smoking room allowed)	Exceptions under conditions of BVerfG
Hesse	Protection from the Dangers of Passive Smoking Act (Non-Smokers Protection Act of Hesse - HessNRSG) dated 6.9.2007	1.10.2007	+	+	- (for temporary operations)	+ (Smoking room allowed)	Exceptions under conditions of BVerfG
Mecklenburg-Western Pomerania	Non-Smokers Protection Act of Mecklenburg-Western Pomerania (NichtRSchutzG M-P) dated 12.7.2007	1.1.2008	+	+	+ (if restaurant under s. 1 GastG)	+ (Smoking room allowed)	Exceptions under conditions of BVerfG
Lower Saxony	Non-Smokers Protection Act of Lower Saxony (Nds.NiSchG) dated 12.7.2007	1.8.2007	+	+	+	+ (Smoking room allowed)	Exceptions under conditions of BVerfG
North-Rhine-Westphalia	Protection of Non-Smokers Act of North-Rhine-Westphalia (Non-Smokers Protection Act NR W - NiSchG NRW) dated 20.12.2007	1.2.2008	+	+	+	+ (Smoking room allowed)	Exceptions under conditions of BVerfG
Rhineland-Palatinate	Non-Smokers Protection Act of Rhineland-Palatinate (NRAuchSchG RP) dated 5.10.2007	15.2.2008	+	-	- (for temporary operations)	+ (Smoking room allowed)	No change

Table A2 (continued)

State	Legal basis of smoking ban	Regulation for hospitality industry prior to BVerfG decision					Regulation after BVerfG decision
		Entry into effect	Smoking room allowed	Smoking ban in micro-enterprises	Smoking ban in party tents	Smoking ban in discothèques	
Saarland	Protection from the Dangers of Passive Smoking Act (Non-Smokers Protection Act - NrauchSchG SL) dated 21.11.2007	15.2.2008	+	- (if owner-operated restaurant without staff)	+	+ (Smoking room allowed)	No change
Saxony	Protection of Non-Smokers in the Free State of Saxony Act (Non-Smokers Protection Act of Saxony - SächsNSG) dated 26.10.2007.	1.2.2008	+	- (if owner-operated restaurant without staff; only since 1.3.2008)	+ (if restaurant under s. 1 GastG)	+ (smoking room not allowed)	Exceptions under conditions of BVerfG
Saxony-Anhalt	Protection of Non-Smokers Act in the State of Saxony-Anhalt (Non-Smokers Protection Act) dated 19.12.2007	1.1.2008	+	+	+ (if restaurant under s. 1 GastG)	+ (smoking room not allowed)	Exceptions under conditions of BVerfG from 22.10.2008
Schleswig-Holstein	Protection from the Dangers of Passive Smoking Act dated 21.11.2007	1.1.2008	+	+	- (for temporary operations)	+ (Smoking room allowed)	Exceptions under conditions of BVerfG
Thuringia	Protection from the Dangers of Passive Smoking Act of Thuringia (Non-Smokers Protection Act of Thuringia - ThürNRSchutzG) dated 20.12.2007	1.7.2008	+	+	+ (if restaurant under s. 1 GastG)	+ (Smoking room allowed)	Exceptions under conditions of BVerfG

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