Advertising expenditure and consumer prices

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ABSTRACT

This paper studies the effect of a change in the marginal costs of advertising on advertising expenditures of firms and on consumer prices. I make use of a policy change in Austria, that involved an increase of the taxation of advertising in parts of the country, and a simultaneous decrease in other parts. I show that advertising expenditures of firms move quickly in the opposite direction of the marginal costs of advertising. Consumer prices increase with advertising in some industries, and decrease in others. This effect correlates with informational differences in advertisements across industries.

Empirical evidence on the reaction of equilibrium market prices to changes in advertising might be helpful to guide the debate on how equilibrium market prices react to changes in advertising costs.

Second, advertising itself is an increasingly important business activity. In the United States, media advertising accounts for almost 2 percentage points of GDP and in Europe for around one percent. In Austria, on which this paper focuses, advertising accounted for a share of 0.009 of GDP in 2000. This was a substantial increase from the year 1990 when the share of advertising in GDP was only 0.0061 (see Grohll et al., 2007). Advertising is one of the main sources of revenue for the media industry and the internet as well as for cultural and sporting events and a better understanding of advertising is relevant for businesses in all these industries.

Third, the taxation of advertising is a recurring policy idea. Here I mention only a few examples. While there are many cities and towns worldwide that tax local advertising, there have also been frequent attempts to introduce advertising taxes at state or national levels. In 1987 the Florida legislature enacted a sales tax on a range of services that included advertising. In a heavy storm of protests the advertising tax was attacked as “unfair, unwise and unconstitutional” (Hellerstein, 1988), and was repealed only six months after its enactment. More recently, in 2006 the Pennsylvanian senate discussed a bill (Senate Bill 854) that attempted to introduce a six percent sales tax on advertising in that state, but was not enacted (see Philadelphia Business Journal 2006). In Europe, the Slovak Republic charged a tax on all advertising expenditure which was eliminated when Slovakia

1. Introduction

This paper studies the effect of a change of the marginal costs of advertising on both advertising expenditures and consumer prices. It makes use of a policy change in Austria that directly affected the marginal costs of advertising, and consequently advertising expenditure. While previous works have estimated the impact of advertising on consumer prices for certain goods, this is the first study to investigate the effect of advertising costs on consumer prices for all major industries and representative data for equilibrium effects of an entire economy. As I show below, advertising increases consumer prices in some industries, and decreases them in others. This heterogeneous effect correlates with the information content of advertisements across industries.

There are at least three important reasons why advertising has been of interest to economists: first, advertising has been debated at length in the theoretical economic literature as it is closely tied to the central topic information and search as well as entry barriers and product quality. Throughout advertising has remained a controversial topic, with contradicting policy recommendations, see below.
entered the European Union in 2004. Hence despite few actual observations of taxation of advertising at state or national levels, it remains a recurring and important political subject, and an idea that is periodically discussed. Almost all countries have laws that ban advertising of certain products, like cigarettes or health related products. These bans are likely to have effects similar to a substantial increase of an advertising tax.

For this investigation I make use of a policy change in Austria in 2000 that harmonized regional taxes on advertising expenditure, thus simultaneously increasing the tax in some parts of the country while reducing it in others, and leaving them roughly similar in a third group. Using this natural experiment, I provide two empirical contributions in this article. First, I show empirically that the taxation of advertising has a strong effect on the advertising expenditures of firms. Second, I show that consumer prices move in different directions across industries. This variation allows me to classify industries by the different ways in which their advertising works. This second finding may be understood by the presence of conflicting informative and persuasive forces. The economic literature has long distinguished these two forms of advertising. Typically, persuasive advertising is advertising which shifts demand outwards and/or decreases elasticities of substitution, both of which serve to increase market prices. Informative advertising increases competition through improved information and thus reduces consumer prices.

Throughout the debate advertising has remained a controversial topic: some economists have argued that there are excessive amounts of advertising, which therefore may be a good target for taxation, while others have suggested that underprovision of advertising might provide a case for a subsidy. The main cause of these conflicting policy conclusions is that advertising can be seen as persuasive or as informative (see Bagwell, 2007). Butters (1977) defines these two views as “advertising as a set of psychological ploys which induce consumers to buy products or brands that they otherwise would not buy”, or as “a provision of information which allows consumers to make more discriminating choices within the framework of a fixed set of preferences”. This distinction has roots further back in the work of Alfred Marshall (1919) who defined similar categories with the names of combative and constructive advertising. The persuasive view of advertising typically sees changes in preferences in the form of an outward shift of demand, a decrease of elasticities of substitution between products, or increased monopoly power of firms, and thus increasing market prices, while the informative view sees increased information for consumers, thus stronger competition and lower market prices (see Nelson 1970, 1974, 1978 or Stahl 1989, 1994). A closely related distinction was brought forward by Johnson and Myatt (2006) who call two related types of advertising ‘hype’ and ‘real information’.

The persuasive view of advertising suggests that advertising shifts demand outwards. Its proponents have often called for a tax on advertising. Kaldor (1950) asserts a harmful effect of advertising and suggests the introduction of a tax on advertising. Further, Sutton (1974) makes the distinction between generated sales and diverting sales from advertising, where the described case would be encountered if there were only diverted and no generated sales. Finally, Gasmı et al. (1992) suggest that the advertising game between Pepsi and Coca Cola is a predatory competition that hardly serves to generate sales for the industry, and should be taxed. By the other view, advertising might serve as a transporter of information. This idea has been formalized in models closely linked to the large literature on consumer search, but instead of consumers searching for products, firms search for consumers via advertising. Here advertising provides useful information to consumers such as the existence, the quality, or the price of a good. This idea has been formalized in models of informative advertising as for example in Butters (1977) or Stahl (1989). In these models advertising expenditure has a marginal effect on a firm’s demand that will correspond to the marginal advertising costs it faces. Therefore a change of the cost function will likely change advertising expenditure, and thus demand. It follows that in these models the taxation of advertising has in general a clear effect on firm variables: more advertisements increase competition in the final goods market and thus lower prices. As demonstrated by Stahl (1989), in these models a subsidy for advertising may be desirable. Thus the discussion of information versus persuasion in advertising follows a large existing literature, and the marginal price responses could be informative about whether informative or persuasive forces dominate in an industry.

This paper proceeds as follows: Section 2 describes the data and empirical strategy used to estimate the effects of a change in marginal advertising costs on advertising expenditures and consumer prices, and Section 3 presents the main empirical results. Section 4 concludes.

2 Ackenberg (2001) argues that advertising that provides product information can be identified, as it should only attract consumers that are inexperienced with the brand. However, this definition of informational advertising is different from the one used in this paper.

3 Some examples for these different viewpoints are: Pigou suggested a tax on advertising in 1929, in addition Dixit and Norman (1978) argued for the possible presence of excessive amounts of advertising. Strivers and Tremblay (2005) present the case for a subsidy. Meurer and Stahl (1994) and Stegeman (1991) discuss models that can have both outcomes.

4 Grossman and Shapiro (1984) argue however that in the case of differentiated products advertising can lead to an inflation of the number of firms, which does not suggest the case for subsidy.

5 Throughout I refer to the nine regional units of Austria as states. In German these units are called Bundesländer. In other publications they may be referred to as provinces or regions.
tax from zero to five percent for local advertisers in Tirol and Burgenland, while in most of the other states and for nation-wide advertising the tax rate dropped from ten to five percent. For a more detailed legal description of the tax before and after the policy change see the legal description (Bundesgesetzblatt, 2000). Fig. 1 shows a map of Austria and highlights the tax changes. In most of the following empirical analysis I omit the states Salzburg and Vorarlberg, where the initial taxes differed at sub-state level, and focus on the difference between tax increase states and tax decrease states.

Two common sets of critiques of differences-in-differences or similar estimators relate to possible endogeneity of selection of the treated group and the timing of the shock. As for endogeneity, since in the present case the policy was of a unifying nature, the difference between the two treatment groups emerges from prior decisions whether or whether not to install a tax on advertising. This difference, and thus the selection into different treatment groups, dates back to the year 1927 when some states decided the matter differently from the rest. Between the years 1927 and 2000, the Austrian First Republic under which the law was established was replaced by a homemade dictatorship, then under German rule, after which the country was governed by the four allies, finally becoming the current republic in 1955. In addition the country experienced the Great Depression, the Second World War, several changes of currency, and membership of the European Union. Thus the economic and political conditions, the legal environment and the structure in the media in the considered states changed dramatically over this period, and there is reason to think that many political differences in the initial period were moderated over this period.

Another concern is that it may be argued that the two treatment groups in the presented experiment are not comparable. Since they lived under different tax regimes prior to the policy change, they might have selected themselves into the more suitable one. There are several answers to this. First, in the regressions concerning advertising expenditure the sample is restricted to businesses that advertised within five percent for local advertisers in Tirol and Burgenland, where the initial taxes differed at sub-state level, and focus on the difference between tax increase states and tax decrease states. To bring this proposal forward (see Bundesgesetzblatt, 2000): it refers to the lengthy debate about the usefulness of such a tax in the country, it lists administrative complications for trans-state businesses due to the different tax regimes, and calls for a general harmonization of taxes to avoid tax competition, although it does not see any signs of such a tax competition taking place, in fact the minutes note that there has been remarkably little adjustment, without pointing to specific references. The minutes from the discussion in the corresponding parliamentary subgroup show that there was one particular cause for the timing of the initiative: A decision of the constitutional high court of Austria (VwGH) from the year 1998 ruled that each local authority may only tax the advertising value generated strictly on its territory. As apparent from the minutes, this decision made the collection of the tax practically impossible in the case of local radio stations. In turn parliament felt that the law had to be adjusted. With no objections, the change was waved through parliament and implemented as quickly as is possible for legal changes on national level. None of these reasons suggests that the timing of the harmonization was chosen in a way that would benefit a particular state. Before the harmonization there was a recurring demand from the chamber of commerce (WKO) and some journalists to abolish the tax altogether, but no political party or representative took the matter into their program. Thus there was no reason to anticipate the harmonization for the year stated prior to the court ruling at the end of 1998. This court ruling was not reported in the press, hence an informed firm could have reasonably anticipated the tax change only after the parliamentary announcements in mid 1999, no more than six months before its introduction.

Another circumstance to invalidate the natural experiment would be if Tirol and Burgenland were simultaneously affected by an important other shock that drove or biased the results. I checked the archives of several national and international newspapers to see if the name Tirol was mentioned significantly more often in 2000 than in the other years of the sample. This was not the case in the archives of the Economist, the New York Times (which has been used in economic studies before to indicate importance of events), the Wirtschaftsblatt, the only Austrian daily that is primarily interested in economic matters, and Die Zeit, a German newspaper that reports frequently on Austrian events, see Table 1. Similar tables for the control group states also do not show an unusual quotation frequency of either state in the year 2000. Similarly, incomes were comparable between the two treatment groups: with a GDP per capita of 26,300 Euro, Tirol was the fourth richest state in Austria in 2000, a position it held in all prior years of the sample (i.e. back to 1995), and much smaller Burgenland was the poorest state. Estimates along the lines of Eq. (1) did not suggest that any state experienced a break in its time trend of income in 2000.

### Table 1
Frequency of articles on Tirol in newspapers.

<table>
<thead>
<tr>
<th>Year</th>
<th>Economist</th>
<th>NYT</th>
<th>WB</th>
<th>Zeit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>0</td>
<td>7</td>
<td>735</td>
<td>28</td>
</tr>
<tr>
<td>2003</td>
<td>0</td>
<td>5</td>
<td>795</td>
<td>22</td>
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<tr>
<td>2002</td>
<td>0</td>
<td>5</td>
<td>863</td>
<td>15</td>
</tr>
<tr>
<td>2001</td>
<td>1</td>
<td>8</td>
<td>776</td>
<td>27</td>
</tr>
<tr>
<td>2000</td>
<td>0</td>
<td>5</td>
<td>741</td>
<td>24</td>
</tr>
<tr>
<td>1999</td>
<td>0</td>
<td>11</td>
<td>748</td>
<td>26</td>
</tr>
<tr>
<td>1998</td>
<td>1</td>
<td>13</td>
<td>702</td>
<td>11</td>
</tr>
<tr>
<td>1997</td>
<td>0</td>
<td>6</td>
<td>n.a.</td>
<td>20</td>
</tr>
<tr>
<td>1996</td>
<td>n.a.</td>
<td>7</td>
<td>n.a.</td>
<td>21</td>
</tr>
</tbody>
</table>

Note: This table shows how often the keyword “Tirol” or “Tyrol” was mentioned in the following newspapers: The Economist, The New York Times, Wirtschaftsblatt and Die Zeit in different years.

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6 Source of regional GDP data: Statistik Austria online database.
The data on advertising expenditures come from “FOCUS Research & Consulting Austria” (see Focus, 2008). This company measures square centimeters of advertisements in newspapers and magazines as well as seconds of advertisements on TV and radio. Using the advertising price lists of these publications, they estimate the advertising expenditures of firms. The company supplied me with their complete dataset from 1995 to 2005, which records advertising expenditure per firm, year, publication and industry. Further they provide the area where each publication is available in each year, and an industry classification for each of the advertising companies.

This dataset does not include all publications available in Austria, but with over 400 news providers it covers all major ones and a wide range of small local magazines. Table 2 reports the number of regional advertisements recorded, the number of regional media (typically local newspapers, here only shown if they are exclusive to one state), the log average cost of an advertisement and the number of firms advertising in each of these publications, by state and also separately for the post and pre treatment period. In total, the dataset contains about 700,000 advertisements for the period considered. Table 2 shows that in terms of firms per publication and average advertising expenditures the values for the state Tirol (that carries most of the different treatments) do not differ widely from values of other states. The number of advertisements and regional media in the treatment state Tirol is at the top of the distribution, in the post period together with Steiermark. The relatively high number of regional media in Tirol in this sample could be due to geographical reasons. Tirol shares only a small fraction of its border with other Austrian states, hence other states have more trans-state advertisers. Burgenland exhibits the smallest number of firms per publication, reflecting its small size and its comparatively low GDP per capita.

The analysis of consumer prices relies on two different datasets provided by the Austrian federal statistical office (Statistik Austria). They provide price indexes for twelve different industries and their subcategories, classified by the COICOP (Classification of Individual Consumption According to Purpose) system of classification from the UN, on a state level and over the period from 1997 to 2003. The disadvantage of this classification is that it is not fine enough to distinguish individual products, and only informs about four digit product groups. Its advantage is that it spans the complete universe of consumer products in Austria, and is designed to be comparable across states and years. It is the most detailed aggregation of products for which the Statistik Austria was willing to share its complete data set. In addition, Statistik Austria provided me with a selection of 40 randomly selected individual products at the most detailed level of aggregation in different states in the same panel.

Fig. 2 displays prices of goods for the main COICOP groups for Tirol and Burgenland and the mean price for that good for the remaining six states in Austria, with Salzburg and Vorarlberg omitted. I also omit communication (COICOP two-digit item 8) which does not vary at state level, as the national mail and the phone companies all operate nationwide with the same prices, from the estimations. Typically I estimate an equation of the following type:

$$y_{it} = Post_i \beta_1 + TaxInc_i \beta_2 + Post_i \times TaxInc_i \beta_3 + \epsilon_{it}.$$  \hspace{1cm} (1)

This regression is similar to a difference-in-difference estimation, with the exception that it uses two treatment groups with different treatment, and no unaffected control group. Post is a variable that takes a value of one for the year of 2003 and a value of zero in the year 1997. TaxInc is a dummy variable that indicates the firms advertising in the states of Tirol and Burgenland, the states with the tax increase. The interaction Post × TaxInc gives the differential coefficient of interest. In the regressions robust standard errors are clustered by state. Although the used data are a panel with many time dimensions, I typically focus on the third years before and the third years after the treatment (1997 and 2003) in order to avoid correlation of errors in the regression (see Bertrand et al., 2004).

3. Results

3.1. Effect on advertising expenditures

As a first approach to the data on advertising expenditures I display total advertising expenditures for tax increase, tax decrease and other states separately. In Fig. 3 I display these three series as indexes normalized to one for the year 1996. As the figure shows, tax decrease states exhibit a higher growth rate of advertising expenditures. There is a small difference between tax increase and tax decrease states in 1999 and 2000, which might reflect some firms that anticipated the tax change. This difference widens greatly from 2000 onwards, in the expected direction. Also, as expected, the line for the “Other” states, that experienced a tax change in between the change of the two other sets of states, lies between the other two states. The central of these three lines is closest to a neutral control group. The tax decrease states are closer to that curve in the years after 2000 than the tax increase states, which could suggest that the differential effect mainly comes from reactions of firms in the tax increase states.

Given that the treatment differs at state level, I only use local advertisers, defined as firms that advertise in one state only to see how growth rates of advertising reacted to the tax change. Since most advertising in Austria is at the national level or across more than one state, this restriction reduces the number of observations in the dataset to less than ten percent. In addition I only use firms that have positive advertising expenditures in all eleven years of the panel from 1995 to 2005 to obtain a balanced panel. The resulting dataset consists of 877 observations in the states of Tirol and Burgenland and 1120 in the other states, and includes a complete panel of total advertising expenditure for each of these firms and each year. The data report the expenditures as they arrive at the publications, and thus report the expenditure net of taxes. Table 3 provides p-values from a two sided test of the equality of growth rates in both sets of states. The test only suggests a difference in the year 2000 with a p-value of 0.03 in the two sided test, while in all other years the p-values of a simple test of differences of means are above 0.05 and also above 0.1. As a placebo test I replace the states with different tax changes with each of the other five states of Austria (again excluding Salzburg and Vorarlberg and in addition Tirol and Burgenland), and rerun the exercise for all these six states and nine years. These p-values from a test for the difference of means are reported in the right panel in Table 3. In the placebo table there is no difference significance at one percent level, and two that are significant are at five percent level.

Table 3 suggests that the difference of growth rates of advertising expenditures as received by the media between states is 25%. If firm expenditures are considered, this difference is less, since those firms that increased their expenditures also had to pay less tax. If the 9.5% tax difference is accounted for, a 9.5% cost difference resulted in a 15.5% difference of advertising expenditures. Thus on average the estimates suggest that a one percent increase of advertising costs results in a 1.6% reduction of advertising expenditure, conditional on firms not exiting from the advertising markets. This is the estimate of the elasticity of advertising expenditures with respect to marginal advertising costs.

To see how the effect differs across industries I provide estimates from a differences-in-differences regression as described in Eq. (1) in the upper part in Table 4. I focus on the third year before and the third year after the treatment (the years 1997 and 2003), which is the most conservative strategy to address the problem of auto-correlation of errors (see Bertrand et al., 2004). I use only firms that are present with
Table 2
Descriptive statistics.

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<tbody>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Burgenland</td>
<td>Up</td>
<td>3962</td>
<td>277</td>
<td>14.6</td>
<td>3.5</td>
<td>7</td>
<td>11.9</td>
<td>126</td>
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<tr>
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<td>Down</td>
<td>9538</td>
<td>561</td>
<td>19.2</td>
<td>11.7</td>
<td>10</td>
<td>12.3</td>
<td>258</td>
</tr>
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<td>Niederösterreich</td>
<td>Down</td>
<td>19,186</td>
<td>1526</td>
<td>18.6</td>
<td>11.8</td>
<td>10</td>
<td>12.6</td>
<td>246</td>
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<tr>
<td>Oberösterreich</td>
<td>Down</td>
<td>11,980</td>
<td>1364</td>
<td>21.9</td>
<td>17.2</td>
<td>8</td>
<td>13</td>
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<td>511</td>
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<td>14.0</td>
<td>8</td>
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<td>1184</td>
<td>19.4</td>
<td>61.6</td>
<td>13</td>
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<td>12.3</td>
<td>276</td>
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<td>Other</td>
<td>2601</td>
<td>344</td>
<td>23.7</td>
<td>10.1</td>
<td>7</td>
<td>12.6</td>
<td>281</td>
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<tr>
<td>Wien</td>
<td>Down</td>
<td>415</td>
<td>1542</td>
<td>32.8</td>
<td>10.8</td>
<td>12</td>
<td>13.4</td>
<td>217</td>
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<tr>
<td>Post</td>
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<td></td>
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<tr>
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<td>276</td>
<td>18.6</td>
<td>8.5</td>
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<td>20.1</td>
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<td>26.5</td>
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<td>12.91</td>
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<td>518</td>
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<td>21.2</td>
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<td>12.55</td>
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<td>28.5</td>
<td>12.7</td>
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<td>13.5</td>
<td>16</td>
<td>13.5</td>
<td>166</td>
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<td>Source:</td>
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<td>SA</td>
<td>Focus</td>
<td>SA</td>
<td>Focus</td>
<td>Focus</td>
<td></td>
</tr>
</tbody>
</table>

Note: Summary statistics for the nine states of Austria. The last four columns consider only regional advertisements, defined as those that are published in publications that appear in only one state. The source abbreviation SA stands for Statistik Austria (2010), Focus refers to Focus (2008).

Fig. 2. Prices. Note: State price index separately for states with increasing and decreasing marginal costs for advertising and 95% confidence intervals around these means. All COICOP 2 consumer price categories are included, except for the prices of Mail and Telecommunications, which do not vary at state level. The states Salzburg and Vorarlberg which have no clear tax change are omitted from the figure.
a significant reduction of advertising expenditures in Tirol and Burgenland for some industries. All coefficients that differ significantly from zero at a ten percent level of significance show a negative coefficient in the differential coefficient, and also the overall mean effect is negative and significantly different from zero.8

In addition I analyze the within firm reallocation. For this exercise I again observe only firms that have positive advertising expenditures in both the years 1997 and 2003 in Tirol or Burgenland and at least one other state. For each firm I aggregate all advertising in states outside Tirol and Burgenland. Thus for the regression there remains a sample with four advertising expenditure observations per firm, within and outside of Tirol in the years 1997 and 2003. This estimation strategy can provide robustness with respect to a possible selection effect, since in this specification the two treatment groups consist of different advertising expenditures of the same firms. In addition, this estimation provides typically more observations since most of the firms in Austria advertise in more than one state. Using this sample I estimate in OLS a differences-in-differences regression, and in this exercise firm fixed effects. The results are reported in the second part in Table 4. There is stronger evidence for a reduction of advertising expenditures in Tirol within firms overall, and for all industries except tourism, coefficients do not vary strongly across industries.

In addition I verify if these expenditures correlate with advertising intensity of industries, but find no evidence for such a correlation. The number of newspapers in which firms decide to advertise did not decline significantly with the advertising tax and remained very stable in states with either direction of the tax change alike. In states with an increase of the tax the mean number of newspapers per firm changed from 2.9 to 2.6 between 1995 and 2005, while in states with a tax decrease the mean number changed from 2.3 to 2.2. I did not find a differential effect for any of the years in between.

An additional concern is that the prices that newspapers charge advertisers could have changed, and that most of the effect is absorbed this way. While I do not observe the prices that newspapers charge directly, I can find evidence from two different channels that this effect is not too pronounced. First, there are types of advertising for which prices have not changed, apart from the tax change, for

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8 I repeat the estimation of column of the first panel using the states classified as ‘Other’ in Fig. 1 as control group. Coefficient Post × Treat is –0.024 with a robust standard error of 0.0105, significant at the 5% level of significance. Comparing the ‘Other’ states with the tax decrease states, the differential coefficient is –0.027 with a robust standard error of 0.1.

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Table 3
Differences of advertising expenditure growth rates.

<table>
<thead>
<tr>
<th>Region</th>
<th>Tirol + Burgenland</th>
<th>Kärnten</th>
<th>Niederö.</th>
<th>Oberö.</th>
<th>Steiermark</th>
<th>Wien</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>0.13</td>
<td>0.349</td>
<td>0.683</td>
<td>0.798</td>
<td>0.231</td>
<td>0.671</td>
</tr>
<tr>
<td>1998</td>
<td>0.10</td>
<td>0.622</td>
<td>0.167</td>
<td>0.083</td>
<td>0.882</td>
<td>0.258</td>
</tr>
<tr>
<td>1999</td>
<td>–0.02</td>
<td>0.578</td>
<td>0.238</td>
<td>0.033</td>
<td>0.723</td>
<td>0.099</td>
</tr>
<tr>
<td>2000</td>
<td>0.25</td>
<td>0.033</td>
<td>0.469</td>
<td>0.294</td>
<td>0.74</td>
<td>0.744</td>
</tr>
<tr>
<td>2001</td>
<td>–0.19</td>
<td>0.123</td>
<td>0.066</td>
<td>0.525</td>
<td>0.036</td>
<td>0.2</td>
</tr>
<tr>
<td>2002</td>
<td>0.01</td>
<td>0.941</td>
<td>0.219</td>
<td>0.527</td>
<td>0.53</td>
<td>0.315</td>
</tr>
<tr>
<td>2003</td>
<td>–0.001</td>
<td>0.593</td>
<td>0.543</td>
<td>0.484</td>
<td>0.739</td>
<td>0.315</td>
</tr>
<tr>
<td>2004</td>
<td>0.14</td>
<td>0.228</td>
<td>0.07</td>
<td>0.211</td>
<td>0.643</td>
<td>0.545</td>
</tr>
</tbody>
</table>

Note: The left part in this table provides results of tests for differences of mean growth rates of advertising expenditures between states with decreasing and increasing marginal tax rates for advertising ($t_d - t_s$) and the p-value from a two-sided test of the difference of the coefficients. The right side in the table provides the p-values of corresponding placebo exercises with each state of the sample with tax decreases tested against the others. The states Salzburg and Vorarlberg are omitted throughout.

---

3.2. Effect on exit from advertising

The estimations so far use a non-balanced panel, as only firms that do not stop advertising are considered. I investigate exit from advertising separately, by estimating Eq. (1) using a probit estimator, for the same industries as in Table 4. The table demonstrates that there is indeed increased exit from advertising in states where the advertising tax increased, with the most statistically significant coefficient in the clothing industry. This finding suggests that the coefficients presented in Table 4 underestimate the true effect, as the underlying data exclude many firms that reacted to the advertising tax change by exit.

Following this finding on exit, I estimate the aggregate effect as in Table 4 only for those industries, where I do not find significant evidence for exit from advertising on the five percent level of significance in Table 5. The aggregate effect is statistically significantly different from zero at five percent level of significance, and not significantly different from the effect in Table 4.

4. Prices

In the literature there is some partial, empirical evidence of how advertising affects prices. In particular, several studies make use of bans of advertising in certain areas for certain goods. They found that advertising seems to decrease prices for eyeglasses (Kwoka, 1984), children’s breakfast cereal (Clark, 2007), and drugs (Cady, 1976). Milay and Waldofeg (1999) present evidence that advertising decreases the price of advertised goods in liquor stores, while it increases the price of non-advertised goods in the same stores. On the other hand, Gallet and Euzenat (2002) suggest that advertising to sales ratios have a positive effect on the supply price in the brewing industry, although Gisser (1999) found no significant relationship in the same industry. The present study is the first that provides such elasticities for all industries.

Again the estimation follows the strategy similar to the common differences-in-differences approach described in Eq. (1). To avoid autocorrelation in the errors I use one observation per time period and unit, the mean price for each state and industry for the years 1997
Table 4
Adverting expenditures across industries.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differences between local advertisers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td>0.0778</td>
<td>-0.105</td>
<td>0.296</td>
<td>-0.0160</td>
<td>0.0536</td>
<td>-0.114</td>
<td>0.0958</td>
<td>0.345**</td>
<td>-0.352</td>
<td>-0.110</td>
</tr>
<tr>
<td>Post × TaxInc</td>
<td>-0.307***</td>
<td>-0.283</td>
<td>-0.860</td>
<td>-0.170</td>
<td>0.0245</td>
<td>-0.494</td>
<td>-0.270***</td>
<td>-0.287***</td>
<td>-0.372</td>
<td>0.184</td>
</tr>
<tr>
<td>State fixed effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1064</td>
<td>56</td>
<td>101</td>
<td>123</td>
<td>30</td>
<td>43</td>
<td>114</td>
<td>326</td>
<td>113</td>
<td>85</td>
</tr>
<tr>
<td>Within tax increase</td>
<td>428</td>
<td>23</td>
<td>48</td>
<td>44</td>
<td>22</td>
<td>21</td>
<td>52</td>
<td>100</td>
<td>51</td>
<td>40</td>
</tr>
</tbody>
</table>

Note: Both parts in the table report diff-in-diff estimates of advertising expenditures using the years 1997 and 2003 in different panels for all firms and by sector. The first panel considers local advertisers; the second panel considers within firm reallocations for cross-state advertisers. Robust standard errors are in parentheses, in the upper panel they are clustered by state.

*** Denotes significance at one percent level.
** Denotes significance at five percent level.
* Denotes significance at ten percent level.

Table 5
Exit from advertising.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post</td>
<td>-0.233***</td>
<td>-0.000656</td>
<td>-0.289***</td>
<td>-0.191</td>
<td>-0.219</td>
<td>-0.416***</td>
<td>-0.226***</td>
<td>-0.129</td>
<td>-0.191</td>
<td>-0.426***</td>
</tr>
<tr>
<td>Post × TaxInc</td>
<td>0.174***</td>
<td>0.689</td>
<td>-0.0411</td>
<td>0.385***</td>
<td>0.839***</td>
<td>0.101</td>
<td>0.371***</td>
<td>-0.0833</td>
<td>0.777***</td>
<td>-0.313***</td>
</tr>
<tr>
<td>State fixed effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1048</td>
<td>64</td>
<td>124</td>
<td>174</td>
<td>56</td>
<td>88</td>
<td>108</td>
<td>28</td>
<td>68</td>
<td>40</td>
</tr>
</tbody>
</table>

Note: The table shows random effects probit estimation results of exit from advertising. Estimates are provided for all firms, and by sector. Post is a variable equal to one in the years 2001–2004 and equal to zero in the years 1995–1999, the data are collapsed into these two periods.

*** Denotes significance at one percent level.
** Denotes significance at five percent level.
* Denotes significance at ten percent level.

Table 6
Prices, main industry groups.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post</td>
<td>0.0203</td>
<td>0.0650***</td>
<td>0.101</td>
<td>0.049***</td>
<td>0.0398 ***</td>
<td>0.0885</td>
<td>0.0709***</td>
<td>-0.2039</td>
<td>0.252***</td>
<td>0.0738***</td>
</tr>
<tr>
<td>TaxInc</td>
<td>-0.00698</td>
<td>0.0101***</td>
<td>0.0119</td>
<td>0.00983</td>
<td>0.0107</td>
<td>0.00282</td>
<td>0.0195***</td>
<td>-0.00400</td>
<td>-0.00465</td>
<td>0.0100***</td>
</tr>
<tr>
<td>Post × TaxInc</td>
<td>0.0367***</td>
<td>-0.0122</td>
<td>0.0100</td>
<td>-0.00945</td>
<td>-0.00850</td>
<td>0.00819</td>
<td>-0.00226**</td>
<td>0.0223</td>
<td>0.104***</td>
<td>-0.0128***</td>
</tr>
<tr>
<td>State f.e.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>42</td>
<td>42</td>
<td>42</td>
<td>56</td>
<td>98</td>
<td>56</td>
<td>56</td>
<td>14</td>
<td>42</td>
<td>70</td>
</tr>
</tbody>
</table>

Note: Diff-in-diff estimates of prices, for all pooled prices and for industries (all two digit COICOP industries are included except mail and telecommunication which does not vary at state level). I use the most disaggregated prices available for each COICOP-2. The treatment group consists of the states where advertising taxes increased (Tirol and Burgenland). Salzburg and Vorarlberg are omitted from the estimation. The pre period uses collapsed prices from 1997 to 1999, and the post period from 2001 to 2003. The coefficient on Post × TaxInc reports the differential effect. Robust standard errors are clustered by state.

*** Denotes significance at one percent level.
** Denotes significance at five percent level.
* Denotes significance at ten percent level.
to 1999 for the pre-treatment effect, and the mean for 2001 to 2003 for the post-treatment effect. Table 6 reports the estimates for all COICOP class 1 industries, except communication which does not vary at state level. To increase the number of observations I use the most disaggregated level for which I can access price information, which goes down to COICOP class 3 level, so that sub categories for industries are used. Some examples to illustrate the most disaggregated level of industry available to me would be ‘Beer’, ‘Gas for heating’ or ‘Bicycles’. In these regressions I apply state fixed effects and cluster robust standard errors by state. This table confirms what is observable in Fig. 2: there is evidence that prices increased in the industries food and education, while they decreased for alcohol and tobacco, transport, hotels and restaurants. Food sold in grocery stores is an industry that frequently advertises on the streets of Austria with concrete price information, often with direct reference to the competition. Hence it is not surprising to find an informative effect in this industry. On the other hand, tobacco and alcohol are known for their persuasive advertisements that appeal to emotion.

The overall effect is estimated in Table 7. The first column presents the baseline specification, the second column includes a linear state trend, and in the third column I weight prices by their importance in the price index. Again these estimates suggest an increase of prices in Tirol and Burgenland, however with a possible delay. The differential coefficient is positive, but not significant when the years 1999–2001 are compared. The effect remains at a similar magnitude for the years 1999–2002, 1999–2003 and 1999–2004, but it increases in significance. This could point to slow adaption to the new equilibrium. Columns (9) and (10) provide two placebo estimates for the periods before and after the treatment (1995–1997 and 2003–2005) and show no differential treatment effect. To find the magnitude of the overall price change, I use the weights for each of the COICOP one digit groups provided by Statistik Austria (2010). These weights indicate the relevance of a given price in the overall price basket for the inflation computation. I also adjust the treatment effect to correspond to the difference of the strengths of the shock in different industries by multiplying it with the share of advertising in each industry that is on the state level.\footnote{The differential coefficient of column (1) when replacing Tirol and Burgenland with Salzburg and Vorarlberg (the ‘Other’ states in Fig. 1) is 0.0015 with a robust standard error of 0.0005, significant at the five percent level of significance. The coefficient shows the expected sign, and is smaller in magnitude. Comparing the ‘Other’ states with the tax decrease states, the coefficient is −0.0014 with a robust standard error of 0.0005, again significant at the five percent level, again showing the expected sign, and again smaller in magnitude.}

The differential treatment effect appears strictly at the regional level. Advertising at the national level experienced a reduction of the tax on advertising from 10 to 5%. This reduction is similar for national advertisers in the states with differential tax changes. The treatment is thus stronger in industries in which the share of local advertising is higher, and price effects can be expected to be larger as well. I compute the share of local advertising for each industry from the Focus data, and plot it against the estimated differential price effects in Fig. 4. The figure shows COICOP category 2 prices for which I found matching industries in the Focus data. See Appendix A for details on the match. The figure shows a strong positive correlation between the share of local advertisers, and the price response. Note that for those industries with a lower share of advertising, the treatment effect is also weaker. If an industry exhibits 50% of its advertising at the local level, its treatment effect is half. In this figure it can be inferred that absolute marginal price responses are roughly similar for different industries.

Prices at industry level, which are aggregations, may be too broad to cover the true effects. Statistik Austria generally does not give access to its data on prices of individual goods, but they agreed to provide me with a small random sample to perform a robustness check. I asked for prices that are comparable across states, from products that may be sold by small local businesses. The data consist of 40 such prices, at the most disaggregated level available to Statistik Austria. Examples of these units that they supplied are \textit{beefsteak in a restaurant}, \textit{an hour of a car mechanic} or \textit{a car wash}. Some of these panel series are incomplete, with missing states or missing years. I drop these products, and in Table 8 I reproduce the same regressions as the ones on the industry level using these detailed prices. As is apparent, the tables give the same signs as the ones based on prices at industry level on the differential effect. However, the number of observations is lower, which sometimes may be the reason for lower statistical significance.

5. Persuasive and informative advertising industries

The observed differences in consumer price changes across industries point to possible differences of the parameters across industries. Consumers may be more easily persuaded to buy certain products such as alcohol and tobacco than to buy certain food. In an industry with parameters such that persuasion is costly, advertising content focuses on the informative aspect of advertising, while industries with persuasive potential will make efforts to put additional elements into their advertisements.
As discussed in the Introduction, there are theoretical arguments to presume a positive correlation between the degree to which advertising leads to a price increase, and the persuasive content of advertising across industries. To test this prediction I rely on a study from the marketing literature that provides a meta-analysis of the information intensity in advertisements from different industries (Abernethy and Franke, 1996, from here on referred to as AF, Table 2). In their article they summarize the findings from 60 studies that measure information content of advertising. Using the methodology developed by Resnik and Stern (1977), which relies on the count of well defined information cues such as if an advertisement contains explicit price information or comparisons with competitors, they give estimates of the information share across industries. I merge their industry with the COICOP industries from Statistik Austria as far as this was possible with confidence (see Appendix A). There is no correlation between the information content of advertising and the share of advertising at the state level. Fig. 5 shows a clear positive correlation between the price response to advertising suggested by the estimates in Table 6 and the information content reported by this meta-study. The correlation between the two series is 74%, a regression with robust standard errors yields a slope that is significantly different from zero at five percent level of confidence. The slope coefficient of the displayed line is 0.02 with a robust standard error of 0.0077. This suggests that the informative effect of advertising is observed in industries with high information content in advertising. The correlation with other industry characteristics that I observe is poor, for example a Herfindahl index of advertising expenditures does not correlate with marginal price responses, with a p-value of 0.75.

6. Summary and magnitudes

The results show a significant relative reduction of advertising expenditures from advertising markets in the states of Tirol and Burgenland after they experienced a relative increase of the overall advertising tax and for the large majority of industries. Further, the results highlight a within-firm reallocation of advertising expenditure out of Tirol. While the advertising expenditures react consistently across industries, consumer prices increase for some and decrease for other industries. In particular, there is evidence that prices increased in the industries food, transportation, education and tourism while they decrease for alcohol and tobacco, health, leisure and house and garden. In the context of this discussion, food (which largely represents food sold by grocery stores) is a large sector in

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In a regression of the information content on the state share with robust standard errors the p-value is larger than 0.76.
which the informative effect of advertising dominates, while alcohol or tobacco are sectors in which persuasion dominates.

The weighted differential growth rates in Table 6 suggest that mean prices in Tirol were about 1% higher than in the other states after the introduction of the tax. This suggests that the 9.5% difference in marginal advertising costs, or the 25.5% difference of advertising expenditures as seen by publications, or the 16% difference of firm expenditures on advertising resulted in a one percent difference of consumer prices. Note that this mean effect is an average of positive and negative growth rates. The effects for certain industries or products can be much higher or lower as apparent in Table 6.

7. Conclusion

In this paper I use a policy change that affected the taxation of advertising to estimate how advertising costs affect advertising expenditure and consumer prices across industries. The results suggest that taxation of advertising is an effective policy tool to reduce advertising. I estimate that a one percent increase of the marginal tax of advertising decreases advertising expenditure by 1.6%. This reduction is similar across industries.

In a second stage, I consider how this change of advertising intensity affects consumer prices. I find that advertising increases consumer prices in some industries such as food in grocery stores, while decreasing them in others, such as alcohol and tobacco. Suggestions from the theoretical literature are ambiguous. Persuasive advertising would increase consumer prices, while informative advertising would decrease them. Persuasive advertising is seen as welfare decreasing, hence there would be a case to tax or otherwise restrict advertising in industries where advertising increases market prices. In fact many countries already restrict advertisements for alcohol and tobacco. On the other hand, informative advertising that decreases market prices is seen as welfare enhancing, thus policy makers should be careful not to tax advertising in those industries in which advertising decreases prices.

For the mean price across all industries, the informative effect of advertising seems to dominate. I estimate that a ten percent increase of advertising tax leads to a 0.5% increase across consumer prices. By this estimation, a complete abolition of the five percent advertising tax in Austria would lower consumer prices by about 0.25% age points. This effect however would differ across industries. The estimates suggest that prices would rise for alcohol, tobacco and other persuasive industries, while food in grocery stores would become cheaper.

Appendix A

In this appendix I provide details on the match of industries in the COICOP classification from the Statistik Austria with the industries from AF, Table 2 on page 10. Since the industries used by AF do not follow a standard classification, I have to link them based on the name. Given that all industries in question are large, well defined groups this is fairly straightforward in most cases. I match COICOP subgroups with the most fitting industry based on names. Then I compute for each industry a weighted mean of information values for each industry, the weights were taken from the price index baskets provided by Statistik Austria (2010). For the table, the estimates from the 1997–2003 differences-in-differences estimates were compared with the percent informative measures provided by AF in Table 2 in page 10.

The COICOP subgroups were merged as follows (the following paragraph shows in bold the main COICOP industry, in italics the COICOP two digit sub-industry, then in unformatted text the matched AF industry): Health: Medical products and equipment: Medicine, medical products; Out-patient services: Services: Hospital services: Personal care; Clothing: Clothing: Clothing; Footwear: Clothing; Hotels, Restaurants: Catering services: Financial, transportation, travel; Accommodation services: Financial, transportation, travel; Transport: Purchase of vehicles: Cars, Operation of personal transport equipment: Financial, transportation, travel, Transport services: Financial, transportation, travel; House, water, electr., gas: Actual rentals for housing: Laundry and household; Maintenance and repair of the dwelling: Laundry and household; Water supply and miscellaneous services: Services: Electricity, gas, and other fuels: Laundry and household; Durable goods: Furniture and furnishing, carpets, floor coverings: Furniture, home furnishes, appliances; Household textiles: Household, lawn, garden; Household appliances: Electronics; Glassware, tableware, and household utensils: Household, lawn, garden; Tools and equipment for house and garden: Furniture, home furnishes, appliances; Goods and services for routine household maintenance: Services Recreation, culture: Audio visual processing equipment: Hobbies, toy, transportation; Other major durables: Hobbies, toy, transportation; Other
recreational items and equipment: Hobbies, toy, transportation; Recreation and cultural services: Services; Newspapers, books and stationary: Toys, leisure, entertainment; Package holidays: Services; Miscellaneous: Personal care; Personal care; Personal effects; Hobbies, toy, transportation; Social protection; Institutional; Insurance; Financial, transportation, travel; financial services; Financial, transportation, travel; Other services; Services; Food: Food.

The match in Fig. 5 was done as follows (COICOP 2 for price data in italics followed by normal text for the advertising data): Gas and fuel; fuel; medical products, pharmaceutical and cosmetic products; shoes (including repair), shoes; food, food; hotel services, hotels; leisure and culture, tourist; household appliances, electronic appliances; water supply, water supply; transportation, transportation; alcohol, alcohol; furniture, furniture (trade); tools for house and garden, garden tools; photography, optic trade; transportation services, services.

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