



## Excise tax avoidance: The case of state cigarette taxes



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### ARTICLE INFO

#### Article history:

Received 12 April 2013

Received in revised form 1 August 2013

Accepted 20 August 2013

Available online 7 September 2013

#### JEL classification:

I18

H2

#### Keywords:

Cigarette taxes

Smoking

Border-crossing

### ABSTRACT

We conduct an applied welfare economics analysis of cigarette tax avoidance. We develop an extension of the standard formula for the optimal Pigouvian corrective tax to incorporate the possibility that consumers avoid the tax by making purchases in nearby lower tax jurisdictions. To provide a key parameter for our formula, we estimate a structural endogenous switching regression model of border-crossing and cigarette prices. In illustrative calculations, we find that for many states, after taking into account tax avoidance the optimal tax is at least 20% smaller than the standard Pigouvian tax that simply internalizes external costs. Our empirical estimate that tax avoidance strongly responds to the price differential is the main reason for this result. We also use our results to examine the benefits of replacing avoidable state excise taxes with a harder-to-avoid federal excise tax on cigarettes.

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### 1. Introduction

Many countries impose excise taxes on alcohol, cigarettes, gasoline, and environmentally-related goods (Cnossen, 2005). Excise taxes are relatively small but non-trivial sources of revenue. On average across the OECD, they account for almost 11% of government revenues (OECD, 2012, p. 63). However, it is widely agreed that the revenues are not the main explanation for which goods are taxed. As Hines argues: “Instead, excise taxes are intended to discourage consumption of the specific taxed goods, thereby preventing some potential consumers from contributing to pollution, traffic congestion, injury, and poor health.” (Hines, 2007, p. 50) In neoclassical welfare economics substantial excise taxes on certain goods, including cigarettes, can be justified as efficient Pigouvian taxes that internalize external costs.<sup>1</sup> Work in behavioral economics suggests that much higher excise taxes may sometimes be justified to correct the “externalities” consumers impose on their future selves by unhealthy time-inconsistent decisions, possibly

including their decisions to smoke (O’Donoghue and Rabin, 2003, 2006; Gruber and Koszegi, 2004).

The potential for corrective cigarette excise taxes might be limited because smokers can avoid excise taxes by making purchases from nearby tax jurisdictions with lower tax rates. In this paper we conduct an applied welfare economics analysis of cigarette tax avoidance. To our knowledge, we are the first study to develop an extension of the standard formula for the optimal Pigouvian corrective tax to incorporate tax avoidance.<sup>2</sup> To provide a key parameter for our formula, we estimate a structural endogenous switching regression model of border-crossing and cigarette prices. When we use our formula and empirical results in illustrative calculations, we find that for many states, after taking into account tax avoidance the optimal tax is at least 20% smaller than the standard Pigouvian tax that simply internalizes external costs. Our empirical estimate that tax avoidance strongly responds to the price differential is the main reason for this result. Regardless of how large smoking’s externalities or internalities are, tax avoidance reduces the effectiveness of state excise taxes as a corrective policy tool. If tax avoidance and evasion directly generate external costs, such as traffic fatalities or illegality costs, the optimal state

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<sup>1</sup> Based on data from the mid-1980s, the seminal study by Manning et al. (1989) concludes that on average cigarette taxes were high enough to correct for the external costs. Cnossen and Smart (Cnossen and Smart, 2005, pp. 36–37), and Sloan et al. (2004) review more recent empirical evidence on the external costs of cigarettes.

<sup>2</sup> The extensive body of theoretical and empirical research on tax evasion and compliance focuses almost entirely on income taxes, not corrective excise taxes (Andreoni et al., 1998; Sandmo, 2005; Slemrod, 2007; Chetty, 2009a).

excise tax on cigarettes is even lower. We also use our results to examine the benefits of replacing avoidable state excise taxes with a harder-to-avoid federal excise tax on cigarettes.

Our paper contributes to policy-relevant lines of research in health economics. Our new empirical results add to estimates from a few recent studies that directly examine cigarette tax avoidance in the U.S. (Chiou and Muehlegger, 2008; Merriman, 2010; Harding et al., 2012). Another line of research in health economics attempts to control for legal consumer tax avoidance and illegal smuggling of cigarettes, but these studies lack direct measures of tax avoidance and mostly focus on developing unbiased estimates of the price elasticities of demand.<sup>3</sup> We estimate that the elasticity of border-crossing with respect to the home-state price of cigarettes is 3.1. This implies that border-crossing accounts for almost one quarter of the response of home-state purchases to changes in the home-state price. While this is a strong response, it is smaller than estimates from several previous studies. Gruber et al. (2003) estimates suggest that tax avoidance accounts about one-third of the response of tax paid sales in Canada. Stehr (2005) estimates that tax avoidance accounts for up to 85% of the response of tax paid sales in the US. Lovenheim (2008) estimates that approximately all of the response in home-state sales is due to tax avoidance. Because these studies lack direct measures of border-crossing they use an indirect approach to infer the extent of tax avoidance. Although we believe our direct measure of cross-border purchases by consumers has important advantages, an advantage of the indirect approach is that it might better capture organized cigarette smuggling over longer distances, which might help explain at least part of the difference in estimates.

Our applied welfare analysis provides a systematic framework for thinking about current cigarette tax policy debates. Since 2000, 48 states and the District of Columbia have enacted over 100 cigarette tax hikes (Federation of Tax Administrators, 2013). Cigarette tax rates currently range from a low of \$0.17 per pack in Missouri to a high of \$4.35 per pack in New York. Some localities also tax cigarettes, the most notable being New York City's \$1.50 per pack tax since 2002, and Chicago and Cook County's combined \$2.68 per pack tax since 2006. Policy makers have realized the potential for tax avoidance created by these large differences in tax rates between sometimes very nearby jurisdictions. In an approach targeted to discourage border-crossing, in 2012 Arkansas established low-tax zones on its side of its borders with lower tax states (Tax Foundation, 2012). In an approach targeted to encourage border-crossing, in 2011 New Hampshire reduced its cigarette tax by \$0.10 per pack to encourage residents of other states to purchase cigarettes in New Hampshire (Love, 2013). While these changes in tax policies seem to have been mainly driven by revenue concerns, our normative analysis examines the impact of taxes and tax avoidance on social welfare more broadly.

The remainder of the paper is organized as follows: Section 2 describes the data; Section 3 presents the endogenous switching regression model; Section 4 summarizes the applied welfare economics analysis; and Section 5 concludes.

## 2. Data

In our empirical study, we use individual-level data on cross-border cigarette purchases. The data are from the 2003 and 2006–2007 cycles of the Tobacco Use Supplements to the U.S. Current Population Survey (TUS-CPS). Each TUS-CPS cycle provides a

large nationally representative sample and sub-samples that are representative at the state level (Hartman et al., 2002). In addition to standard questions about smoking, in the cycles we use the TUS-CPS asked smokers whether their last purchase of cigarettes was in a state other than their state of residence, or over the internet or by other means. The “last purchase” can be considered to be a random draw from the distribution of each smoker's purchases. The responses should provide an accurate snapshot of consumer behavior, even though for a specific smoker the last purchase might not be typical of his or her purchases. Smokers might not take the question literally and instead based their responses on their typical or modal purchase location. It is difficult to judge the magnitude or direction of the resulting measurement error. Compared to literal responses, responses about typical purchases might even contain less of the random noise created by non-typical purchases. In any case, because most smokers make fairly frequent cigarette purchases, self-reported data on their most recent purchases seem likely to be reasonably accurate.<sup>4</sup>

We use geographic information on the respondents' location to merge data on excise taxes in their home states and bordering states, as well as to measure their distance to the state border. In order to calculate distance to the state border for each respondent, we restrict the sample to residents of 234 Metropolitan Statistical Areas (MSAs) identified in the TUS-CPS. Our sample of analysis consists of 29,377 smokers who lived in an MSA and provided valid responses to the questions about border-crossing and cigarette price paid.<sup>5</sup> We used Google Maps to calculate the driving distance from the geographic center of each respondent's MSA of residence to the closest lower tax border state. We match cigarette excise tax rates from Orzechowski and Walker (2008) to respondents, based on their MSA, the closest border state, and their interview month. When MSAs span state lines, we match tax rates and assign distance to the closest lower tax border state based on the respondents' state of residence.<sup>6</sup> Respondents in the Chicago and New York City MSAs are also assigned the applicable local cigarette taxes. We do not add state and local general sales taxes. Most states' sales taxes are in the range of 4–7% of the purchase price (Tax Foundation, 2012). Average cigarette prices in our data are around \$3.00–\$3.50 (Table 1), so

<sup>4</sup> Comparisons of reported consumption to sales suggests that smokers substantially under-report their true consumption (Stehr, 2005). But validation research that uses biological evidence of nicotine use suggests that people fairly accurately report whether they smoke (Patrick et al., 1994). Given that the TUS-CPS respondents admit that they smoke, it is not clear why they would inaccurately report their cross-border purchases, which are generally legal when for personal consumption.

<sup>5</sup> The TUS-CPS also provides county of residence. There are two advantages to using MSA of residence. First, because MSAs are defined based on commuting patterns and the degree of economic integration in a geographic area, they are a natural geographic unit for a study of consumer purchases and travel. Second, the TUS-CPS provides more complete information about MSAs than about counties. Of the 234 identified MSAs, the county is missing for almost half. In an earlier study of border crossing that uses the 2003 TUS-CPS, Chiou and Muehlegger (2008) limit their sample to the 9,745 smokers with identified county of residence. Our 2003 TUS-CPS sample includes 16,745 smokers with identified MSA of residence, and includes virtually all of the respondents with identified county of residence. 41 of the identified MSAs contain multiple identified counties, but we do not use that information.

<sup>6</sup> For example, the Kansas City MSA spans Kansas and Missouri. We assign Kansas City MSA residents who live in Kansas the Kansas tax of \$0.79, and assign them a distance of 10 miles to the closest lower-tax state (Missouri). We assign Kansas City MSA residents who live in Missouri the Missouri tax rate of \$0.17, and assign them a distance of 421 miles to the closest lower-tax state (Kentucky). Because we do not have more precise geocode information, this method might introduce measurement error into our measures of tax rates and distances. As a robustness check, we excluded the 23% of our sample who live in MSAs that span state lines, and re-estimated reduced-form versions of the border-crossing model reported below. The results (available upon request) from the sub-sample analysis are generally similar to the full sample analysis, but suggest a somewhat weaker response to distance and taxes.

<sup>3</sup> Cigarette demand studies that emphasize the role of tax avoidance and smuggling include Coats (1995), Saba et al. (1995), Thursby and Thursby (2000), Yurekli and Zhang (2000), Stehr (2005), and Lovenheim (2008).

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