

# Socioeconomic and country variations in cross-border cigarette purchasing as tobacco tax avoidance strategy. Findings from the ITC Europe Surveys

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## ABSTRACT

**Background** Legal tobacco tax avoidance strategies such as cross-border cigarette purchasing may attenuate the impact of tax increases on tobacco consumption. Little is known about socioeconomic and country variations in cross-border purchasing.

**Objective** To describe socioeconomic and country variations in cross-border cigarette purchasing in six European countries.

**Methods** Cross-sectional data from adult smokers (n=7873) from the International Tobacco Control (ITC) Surveys in France (2006/2007), Germany (2007), Ireland (2006), The Netherlands (2008), Scotland (2006) and the rest of the UK (2007/2008) were used. Respondents were asked whether they had bought cigarettes outside their country in the last 6 months and how often.

**Findings** In French and German provinces/states bordering countries with lower cigarette prices, 24% and 13% of smokers, respectively, reported purchasing cigarettes frequently outside their country. In non-border regions of France and Germany, and in Ireland, Scotland, the rest of the UK and The Netherlands, frequent purchasing of cigarettes outside the country was reported by 2–7% of smokers. Smokers with higher levels of education or income, younger smokers, daily smokers, heavier smokers and smokers not planning to quit smoking were more likely to purchase cigarettes outside their country.

**Conclusions** Cross-border cigarette purchasing is more common in European regions bordering countries with lower cigarette prices and is more often reported by smokers with higher education and income. Increasing taxes in countries with lower cigarette prices, and reducing the number of cigarettes that can be legally imported across borders could help to avoid cross-border purchasing.

## INTRODUCTION

Tobacco tax increases have been demonstrated to be the single most effective and cost-effective intervention for reducing tobacco use.<sup>1,2</sup> However, not all smokers react to tax increases by quitting smoking because they have several other options.<sup>3</sup> Smokers may not let the tax increase influence their smoking behaviour, they may cut back on the number of cigarettes smoked, or switch to discount brands or rolling tobacco. Moreover, they may use legal tax avoidance strategies, such as internet shopping and cross-border shopping or illegal tax evasion strategies, such as smuggling or buying

counterfeit tobacco.<sup>3</sup> Tax avoidance and evasion strategies may attenuate the impact of tax increases on tobacco consumption<sup>4</sup> (although some have a different view<sup>5</sup>) and reduce tax revenue, and also may undermine confidence in law enforcement.

The European Union (EU) has open borders between EU countries and tax and price rates of tobacco differ substantially between EU countries.<sup>1,6–8</sup> In 2009, cigarette prices varied sixfold and affordability fourfold, between EU countries.<sup>8</sup> Europe's open borders might tempt smokers from countries with high cigarette prices to use cross-border cigarette purchasing as a tobacco tax avoidance strategy. According to the EU regulations, there are no limits on how much tobacco private persons can import from other EU countries, as long as the products are purchased for personal use and transported by the smoker himself. Although EU countries may set guide levels (ie, upper limits) on what may be considered personal consumption, the guide level may not be less than 800 cigarettes or 1 kg of rolling tobacco. Limits for importing tobacco from non-EU countries, however, vary from 40 to 200 cigarettes and 50 to 250 g of rolling tobacco.

Previous research showed that cross-border cigarette purchasing was not a problem in Europe in the 1990s.<sup>6</sup> Not many travellers bought tobacco abroad, and those who did bought only small quantities.<sup>6</sup> This could have changed in the 21st century, because the number of EU countries has grown from 12 countries in 1995 to 27 countries in 2007. Also, the price differentials for the same cigarette brand increased from 240% in 1995<sup>6</sup> to 590% in 2007.<sup>7</sup> Recent studies showed that France has significant amounts of cross-border purchasing,<sup>9–11</sup> mainly from Spain, Belgium and Luxembourg.<sup>8</sup> A European Commission survey showed that in 2008, cross-border purchasing was highest in Ireland, the UK and France.<sup>12</sup> However, this study asked about purchasing cigarettes at their last trip in another EU country and did not take into account how often people crossed the border and purchased cigarettes. People may buy cigarettes when they happen to be in a country for a different reason (eg, vacation or business) or they may purposely cross the border to buy cheaper cigarettes. Purposely crossing the border for cheaper cigarettes might be a frequent activity primarily among smokers living close to the border of a country with lower cigarette prices.<sup>13</sup> A study in Germany showed that cross-border cigarette purchasing was

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strongly associated with living near countries with lower cigarette prices, that is, Luxembourg, Poland and the Czech Republic.<sup>14</sup>

In Europe, smoking is more common among lower than higher socioeconomic status (SES) groups.<sup>12</sup> While tobacco tax increases are found to stimulate tobacco use reduction especially among smokers of lower SES,<sup>14</sup> there may also be socioeconomic differences in tax avoidance. Knowledge about SES differences in tax avoidance is important because it may provide information about possible effects of policies that are designed to reduce tax avoidance and whether these are beneficial or detrimental for low SES smokers. Not much is known about this because few studies have used individual-level data to examine tax avoidance strategies. Three studies that used individual-level data and examined socioeconomic differences did not distinguish between cross-border cigarette shopping and other tax avoidance behaviours.<sup>15–17</sup> The few studies that have examined individual differences in cross-border shopping had mixed results.<sup>12 14 18 19</sup> A study from Germany<sup>14</sup> and an EU-wide study<sup>12</sup> found no educational differences. However, recent studies from the USA found that smokers with higher education and income were more likely to purchase cigarettes in another state.<sup>18 19</sup>

In this study, we describe socioeconomic and country variations in cross-border cigarette purchasing in France, Germany, the Republic of Ireland, The Netherlands and the UK. The UK and Ireland are the two European countries with the highest cigarette prices.<sup>7</sup> Cigarette prices in France and Germany are somewhat lower, while The Netherlands has the lowest cigarette prices of the countries in this study. France and Germany have large borders with countries that have considerably lower cigarette prices. Therefore, we expect cross-border purchasing to be most prevalent in France and Germany.

The following research questions were examined in this study: (1) are there country variations in the prevalence of cross-border cigarette purchasing? (2) are there socioeconomic variations in the prevalence of cross-border cigarette purchasing?

## METHODS

### Sample

Cross-sectional data from 7873 adult smokers from the International Tobacco Control (ITC) Europe Surveys in France, Germany, Ireland, The Netherlands and the UK were used. Results are reported separately for Scotland and the rest of the UK because the ITC Scotland Survey was a separate survey from the ITC UK Survey with its own representative sample of smokers from Scotland. Because the ITC Ireland Survey ended in 2006 and the ITC Netherlands Survey began in 2008, survey waves closest to 2007 were used for the study. See table 1 for fieldwork periods, sample sizes and cooperation rates for each ITC Survey.

Respondents were recruited using probability sampling methods with fixed line telephone numbers selected at random from the population of each country and were surveyed using telephone interviewing. Respondents were eligible if they had smoked at least 100 cigarettes in their lifetime and currently smoked at least once per month. The Netherlands sample differed in that most respondents were surveyed using web interviewing instead of telephone interviewing.<sup>21</sup> The Dutch web sample was drawn from a large probability-based database with respondents who had indicated their willingness to participate in research on a regular basis. Therefore, multivariate analyses controlled for interviewing mode.

### Ethics

All surveys were cleared for ethics by the Office of Research Ethics of the University of Waterloo, Canada, and also by the appropriate institutions in all participating countries.

### Measurements

The questions used for the ITC Europe Surveys were all adapted from the conceptual model and questionnaire of the ITC Four Country Survey.<sup>22</sup>

Cross-border cigarette purchasing was measured by asking respondents whether they had bought cigarettes outside their country in the last 6 months. Respondents who answered in the affirmative were asked how often they had done this in the

**Table 1** Fieldwork period, sample size of current smokers and cooperation rate for each International Tobacco Control (ITC) Europe Survey

	Fieldwork period	Sample size	Cooperation rate (%)*
Netherlands†			
Telephone sample	March 2008–April 2008	404	78.1
Web sample	April 2008	1668	78.1
France‡	December 2006–February 2007	1735	75.3
Germany§	July 2007–November 2007	1515	94.9
Republic of Ireland¶	February 2006–March 2006	577	71.9
Scotland**	February 2006–March 2006	507	66.7
UK (w/o Scotland)††	September 2007–February 2008	1467	74.6
Total		7873	

\*Cooperation rates were calculated according to the AAPOR definition COOP4: The proportion of all cases interviewed of all eligible respondents who were contacted and capable of doing the interview.<sup>20</sup> The rate for the Republic of Ireland is equal to the retention rate, because respondents lost to follow-up in the preceding wave were not replenished in the survey wave that was used for this study.

†Provinces in The Netherlands: Drenthe (n=63), Flevoland (n=32), Friesland (n=107), Gelderland (n=237), Groningen (n=90), Limburg (n=148), Noord-Brabant (n=327), Noord-Holland (n=324), Overijssel (n=142), Utrecht (n=123), Zeeland (n=35), Zuid-Holland (n=444).

‡Regions in France: Alsace (n=53), Aquitaine (n=103), Auvergne (n=40), Bourgogne (n=53), Bretagne (n=102), Centre (n=65), Champagne-Ardennes (n=44), Franche-Comté (n=37), Ile-de-France (n=308), Languedoc-Roussillon (n=61), Limousin (n=15), Pays de la Loire (n=85), Lorraine (n=87), Midi-Pyrénées (n=73), Nord-Pas-de-Calais (n=117), Haute-Normandie (n=69), Basse-Normandie (n=43), Picardie (n=60), Poitou-Charentes (n=42), Provence-Alpes-Côte-d'Azur (n=134), Rhône-Alpes (n=144).

§States in Germany: Baden-Württemberg (n=93), Bavaria (n=245), Berlin (n=78), Brandenburg (n=59), Bremen (n=14), Hamburg (n=42), Hessen (n=116), Mecklenburg-Vorpommern (n=18), Lower Saxony (n=104), North Rhine-Westphalia (n=370), Rhineland-Palatinate (n=85), Saarland (n=19), Saxony (n=85), Saxony-Anhalt (n=66), Schleswig-Holstein (n=68), Thuringia (n=53).

¶Geographic regions in Ireland: Dublin City and County (n=169), Rest of Leinster (n=142), Munster (n=160), Connaught and Part of Ulster (n=106).

\*\*Geographic regions in Scotland: Argyll and Clyde (n=48), Ayrshire and Arran (n=33), Borders (n=5), Dumfries and Galloway (n=9), Fife (n=37), Forth Valley (n=23), Grampian (n=62), Greater Glasgow (n=84), Highland (n=23), Lanarkshire (n=41), Lothian (n=93), Orkney Shetland and Western Isles (n=6), Tayside (n=43).

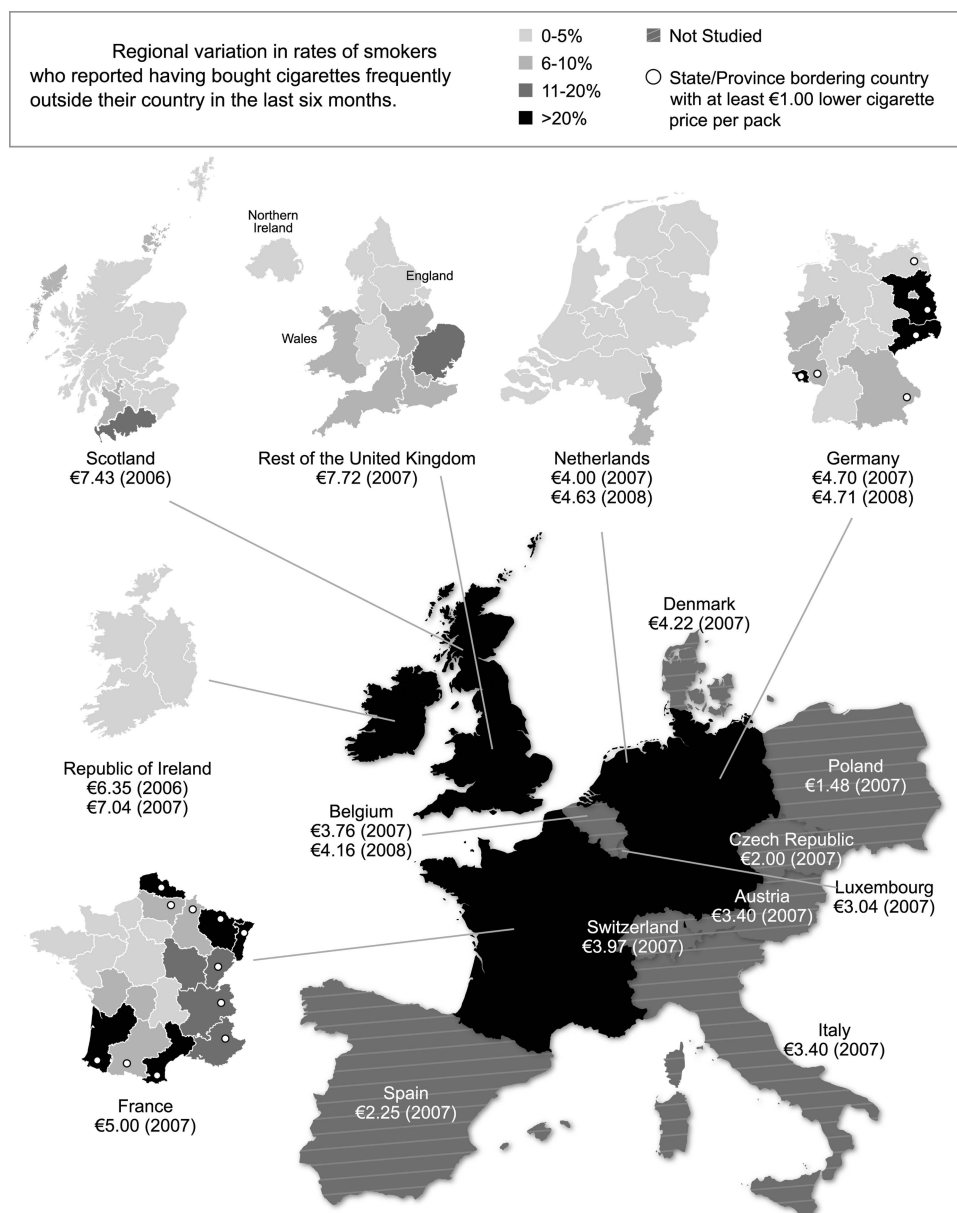
††Regions in UK (w/o Scotland): East Midlands (n=119), Eastern (n=134), London (n=216), North East (n=75), North West (n=160), Northern Ireland (n=53), South East (n=216), South West (n=137), Wales (n=98), West Midlands (n=142), Yorkshire and the Humber (n=117).

previous 6 months. Response categories were 'Only once', 'A few times', 'Many times' and 'All of the time'. A new variable with three categories was constructed for the analyses: (1) no cross-border cigarette purchasing; (2) occasional (ie, only once and a few times) and (3) frequent (ie, many times and all of the time) cross-border cigarette purchasing.

Respondents were categorised as living or not living in a province/state bordering a country that has cigarette prices at least €1.00 lower per pack. The retail price of the most popular price category cigarettes in January of the survey year was used.<sup>23</sup> This is country-level price data, as tobacco taxation does not vary at the regional level within the included countries. The neighbouring countries of The Netherlands, Ireland and Scotland did not have cigarette prices €1.00 lower per pack in the ITC survey year that was used in this study (see figure 1). All neighbouring countries of France and some of the neighbouring countries of Germany (ie, Poland, the Czech Republic and Austria) had cigarette prices at least €1.00 lower per pack. Therefore,

respondents from the French provinces Alsace, Aquitaine, Champagne-Ardenne, Franche-Comté, Languedoc-Roussillon, Lorraine, Midi-Pyrénées, Nord-Pas-de-Calais, Picardie, Provence-Alpes-Côte-d'Azur and Rhône-Alpes, and respondents from the German states of Bavaria, Brandenburg, Mecklenburg-Vorpommern, Rhineland-Palatinate, Saarland and Saxony were categorised as living in a province/state bordering a country that has cigarette prices at least €1.00 lower per pack.

Education and income were used as indicators of SES.<sup>24</sup> Education was categorised into three levels: low (no degree, elementary school and lower secondary education), moderate (secondary vocational education and middle secondary education), and high (upper secondary education, university and post-graduation). The education levels were only partly comparable across countries because of differences in educational systems. Respondents from most countries were asked about their gross household income per month. However, respondents from Germany and France were asked about their net household



**Figure 1** Regional variation in rates of smokers who reported having bought cigarettes frequently outside their country in the last 6 months. Prices in the figure are the retail prices of the most popular price category cigarettes in January of the year shown in brackets.

income. Also, answering categories were not comparable across all countries. Therefore, we created a relative income variable that was categorised into tertiles for each country. Respondents who did not answer the income question ( $n=952$ ) were recorded in a separate category.

Covariates in the multivariate analyses were gender, age group (18–24, 25–39, 40–54 and 55 years and older), employment, smoking status (daily vs occasional smoker), heaviness of smoking, intention to quit (within 6 months vs not within 6 months), smoking exclusively rolling tobacco and/or manufactured cigarettes, and interviewing mode. The Heaviness of Smoking Index (HSI) was created as the sum of two categorised measures: number of cigarettes per day and time before smoking the first cigarette of the day.<sup>25</sup> HSI values ranged from 0 to 6 with higher values indicating stronger nicotine dependence.<sup>25</sup>

## Analyses

To confirm that our measure of cross-border cigarette purchasing is indicative of a tax avoidance strategy, we analysed the differences in the average of self-reported prices for a pack of cigarettes at last purchase between respondents who reported frequent, occasional and no cross-border purchasing in the last 6 months, with *t* tests. Country and socioeconomic variations in the prevalence of cross-border cigarette purchasing were examined with  $\chi^2$  tests. Also, a multinomial logistic regression analysis was performed with cross-border cigarette purchasing as the dependent variable. Although the dependent variable had an ordinal distribution, we employed multinomial regression because this analysis was capable of producing estimated ORs for both occasionally and frequently purchasing cigarettes outside the country rather than not purchasing cigarettes outside the country, according to values of the independent variables. Independent variables were gender, age group, educational level, income level, employment, smoking status, heaviness of smoking, intention to quit, smoking exclusively rolling tobacco, country/region and interviewing mode.

## RESULTS

### Sample characteristics

Sample characteristics for each country and (border or non-border) regions are shown in table 2. There were significant country/region differences in all variables that were used in this study. Differences between countries were relatively large for educational level. However, it should be noted again that educational levels were only partly comparable across countries. The Netherlands had the highest percentage of smokers not willing to answer the question about their income. Unemployment among smokers was highest in Scotland. Smokers from Scotland and the rest of the UK were most often daily smokers and scored highest on the HSI. Smokers from Scotland had the highest intention to quit smoking within 6 months. Smokers from The Netherlands were more likely to report smoking exclusively rolling tobacco, while smoking factory made cigarettes exclusively or alongside rolling tobacco was reported most often by smokers from Ireland.

There were some significant differences in sample characteristics between smokers living in border and non-border provinces/states in France and Germany. Smokers from border provinces of France were less educated, had lower income levels, and were more often unemployed than smokers from non-border provinces of France. Smokers from border states of Germany were more often male, were less educated and smoked more often factory made cigarettes than smokers from non-

border states. These differences may affect or be affected by the decision to purchase cigarettes across the border.

### Confirmation of cross-border cigarette purchasing measure

Respondents who reported having frequently purchased cigarettes outside their country in the last 6 months paid significantly less for their cigarettes (on average €4.24 for one pack) than respondents who reported having occasionally purchased cigarettes outside their country (€4.64) ( $t=2.57$ ,  $p=0.011$ ). There was no significant difference in price paid for a pack of cigarettes between respondents who reported having occasionally purchased cigarettes outside their country and respondents who reported not having purchased cigarettes outside their country in the last 6 months (€4.85) ( $t=0.93$ ,  $p=0.351$ ).

The same pattern was found in each country except Ireland. In Ireland, smokers who frequently bought cigarettes outside their country paid significantly more for their cigarettes than other respondents. The decrease in price between smokers who frequently bought cigarettes outside their country and those who bought them occasionally was largest in France and Germany.

### Country variations in cross-border cigarette purchasing

As can be seen in table 3, there were large differences in cross-border cigarette purchasing between countries and regions ( $\chi^2$  (14)=771.59,  $p<0.001$ ). Highest rates of smokers reporting frequently purchasing cigarettes outside their country in the last 6 months were found in the border regions of France (24%) and Germany (13%). In non-border regions of France and Germany, only 5% reported frequent cross-border cigarette purchasing in the last 6 months. Highest rates of smokers reporting not having purchased cigarettes outside their country were found in The Netherlands (83%), Scotland (78%) and Ireland (74%).

### Socioeconomic variations in cross-border cigarette purchasing

Table 3 shows that there were significant variations in cross-border cigarette purchasing between educational levels ( $\chi^2$  (4)=130.19,  $p<0.001$ ) and income levels ( $\chi^2$  (6)=184.88,  $p<0.001$ ), in particular for occasional purchasing. Of smokers with a high educational level, 31% reported occasionally buying cigarettes outside their country, and 8% reported frequently buying cigarettes outside their country in the last 6 months. For smokers with a low educational level, the percentages were 18% and 5%, respectively. Of smokers with a high income level, 32% reported occasionally buying cross-border and 8% frequently. Of smokers with a low income level, 19% reported occasionally buying cross-border and 6% frequently.

### Correlates of cross-border cigarette purchasing

The multinomial logistic regression analysis in table 4 shows that occasionally buying cigarettes outside the country was more frequently reported by younger smokers, smokers with a higher education and income level, employed smokers, daily smokers, smokers who smoked factory made cigarettes, and telephone respondents. The correlates of frequently buying cigarettes outside the country were mostly comparable, with a few notable differences. Smokers who reported frequently purchasing cigarettes outside their country were more likely to be heavier smokers and were less likely to plan to quit smoking. Smoking factory made cigarettes was not associated with frequent cross-border purchasing. The strongest correlate of frequent cross-border cigarette purchasing was country and region. Respondents living in a border province of France, a border



**Table 2** Differences in demographic and smoking characteristics across country and (border or non-border) region (%)

	Netherlands (n=2072)	France Border provinces* (n=879)	Non-border provinces (n=856)	Germany Border states† (n=469)	Non-border states (n=1046)	Ireland (n=577)	Scotland (n=507)	UK (w/o Scotland) (n=1467)	Test of differences between country/ region
<i>Demographic characteristics</i>									
Gender									
Female	45.7	46.3	42.4	36.8	44.8	45.4	45.8	49.8	$\chi^2$ (7)=29.16
Male	54.3	53.7	57.6	63.2	55.2	54.6	54.2	50.2	p<0.001
Age group									
18–24	11.5	17.9	17.0	14.5	13.4	19.9	11.5	13.4	$\chi^2$ (21)=167.42
25–39	29.3	33.2	38.0	27.7	32.5	34.8	25.5	35.5	p<0.001
40–54	34.7	35.0	30.0	36.0	36.2	25.8	33.2	30.4	
55 years and older	24.5	13.9	14.9	21.7	17.9	19.4	29.8	20.7	
Educational level									
Low	35.4	16.8	17.0	29.3	19.5	31.1	23.0	24.0	$\chi^2$ (14)=452.03
Moderate	44.7	39.0	33.6	34.7	38.0	32.3	35.3	31.5	p<0.001
High	19.9	44.2	49.4	36.0	42.5	36.5	41.7	44.5	
Income level									
Low	24.9	27.2	23.9	24.5	21.8	37.6	38.1	28.6	$\chi^2$ (21)=477.60
Moderate	23.0	30.0	26.5	24.1	28.8	20.8	28.2	31.4	p<0.001
High	30.1	40.0	45.4	36.7	35.9	33.4	25.2	30.7	
No answer	22.0	2.7	4.1	14.7	13.6	8.1	8.5	9.3	
Employment									
Unemployed	39.3	33.1	28.4	28.3	25.7	33.1	46.6	39.1	$\chi^2$ (7)=124.48
Employed	60.7	66.9	71.6	71.7	74.3	66.9	53.6	60.9	p<0.001
<i>Smoking characteristics</i>									
Smoking status									
Daily smoker	92.7	92.0	90.7	92.3	90.7	89.6	93.3	95.8	$\chi^2$ (7)=39.55
Occasional smoker	7.3	8.0	9.3	7.7	9.3	10.4	6.7	4.2	p<0.001
Heaviness of smoking†									
0–1	28.4	44.5	48.2	43.2	37.7	30.4	23.0	23.7	$\chi^2$ (14)=311.70
2–4	63.7	52.1	48.3	51.4	56.9	61.2	63.7	68.4	p<0.001
5–6	7.9	3.4	3.5	5.4	5.5	8.4	13.2	8.0	
Intention to quit									
Not within 6 months	78.5	62.8	61.3	77.4	73.3	64.6	58.4	73.1	$\chi^2$ (7)=189.05
Within 6 months	21.5	37.2	38.7	22.6	26.7	35.4	41.6	26.9	p<0.001
Smokes exclusively rolling tobacco									
Yes, exclusively rolling tobacco	32.1	13.1	11.3	10.0	13.9	4.3	17.0	27.5	$\chi^2$ (7)=451.03
No, factory made cigarettes or both	67.9	86.9	88.7	90.0	86.1	95.7	83.0	72.5	p<0.001

\*State/province bordering country with cigarette prices at least €1.00 lower per pack (retail price of the most popular price category cigarettes in January of the survey year).

†Heaviness of smoking is used as a continuous variable in the regression analyses; HSI values ranged from 0 to 6 with higher values indicating stronger nicotine dependence.

state of Germany, and respondents living in the UK (excluding Scotland) were more likely to frequently buy cigarettes outside their country than respondents from The Netherlands. The Netherlands was chosen as the reference country because cross-border purchasing was lowest in this country.

### Cross-border cigarette purchasing in border regions

As illustrated in figure 1, the highest rates of frequent cross-border purchasing were found in the French provinces Nord-Pas-de-Calais, Lorraine, Alsace, Aquitaine and Languedoc-Roussillon, and in the German states of Brandenburg, Saxony and Saarland. These provinces/states border Belgium (Nord-Pas-de-Calais and Lorraine), Luxembourg (Lorraine and Saarland), Switzerland and Germany (Alsace), Spain (Aquitaine and Languedoc-Roussillon), Poland (Brandenburg and Saxony) and the Czech Republic

(Saxony). Please note that figure 1 provides merely an indication of regional variations as the number of respondents is low for some provinces/states (see footnotes of table 1). In other analyses, respondents from all border provinces/states were taken together per country which yielded a satisfactory number of respondents per category (see table 2).

An additional multinomial logistic regression analysis was performed on respondents from the above mentioned French provinces and German states with the highest rates of frequent cross-border cigarette purchasing (n=552, not shown in tables). A notable difference with the correlates of cross-border purchasing among all respondents of the study was that higher income was not associated with frequent cross-border purchasing but it was associated with fewer reports of occasional cross-border purchasing.

**Table 3** Differences in cross-border cigarette purchasing between country/region, educational levels and income levels (%)

	No cross-border purchasing	Occasional cross-border purchasing	Frequent cross-border purchasing	Test of differences in cross-border purchasing
Country and region				
Netherlands	82.7	14.9	2.4	$\chi^2$ (14)=771.59 p<0.001
Border provinces of France	48.6	27.8	23.7	
Non-border provinces of France	66.5	28.9	4.6	
Border states of Germany	52.6	34.0	13.4	
Non-border states of Germany	64.3	30.8	4.9	
Ireland	73.5	23.4	3.1	
Scotland	77.9	17.6	4.5	
UK (w/o Scotland)	63.3	30.1	6.6	
Educational level				
Low	76.5	18.2	5.3	$\chi^2$ (4)=130.19 p<0.001
Moderate	69.4	23.5	7.1	
High	61.4	30.7	7.8	
Income level				
Low	75.7	18.5	5.8	$\chi^2$ (6)=184.88 p<0.001
Moderate	69.0	23.6	7.4	
High	59.2	32.4	8.4	
No answer	75.7	19.7	4.5	

## DISCUSSION

This study showed that in most of the European countries studied, only a small minority of smokers reported frequent cross-border cigarette purchasing. The proportion was, however, higher in French and German provinces/states bordering countries with lower cigarette prices (ie, Belgium, Luxembourg, Switzerland, Spain, Poland and the Czech Republic), where 24% of French smokers and 13% of German smokers reported purchasing cigarettes frequently outside their country. In non-border regions of France and Germany, Ireland, the UK and The Netherlands, frequently purchasing cigarettes outside the country was reported by only 2–7% of smokers. Occasionally purchasing cigarettes outside the country was more commonly reported, but this might not always be indicative of tax avoidance. Smokers who occasionally purchased cigarettes outside the country did not pay significantly less on average for their cigarettes than smokers who never purchased outside the country, whereas smokers who frequently purchased outside the country did pay significantly less on average. Therefore, we suspect that smokers who cross the border frequently and buy cigarettes may do this intentionally to avoid taxes, whereas smokers who do this occasionally may be outside their country in the normal course of their activities, and could take advantage of such travelling by purchasing cheaper cigarettes.

Cross-border cigarette purchasing was more prevalent among smokers with higher education and income. This is a somewhat counterintuitive finding, and seems contradictory to earlier findings that low SES smokers use contraband cigarette purchasing as a strategy to deal with the increased cost of cigarettes.<sup>11–26</sup> However, other studies have also shown that higher SES smokers are more likely to purchase cigarettes from low or untaxed sources than lower SES smokers.<sup>15–17</sup> A possible explanation is that cross-border purchasing incurs travel costs, which smokers with lower education and income may not be able to pay up-front,<sup>16</sup> while purchasing contraband cigarettes is often possible in the immediate social environment of low SES smokers.<sup>26</sup> Additionally, the larger percentage of more highly educated and high-income smokers who occasionally purchase cigarettes abroad

may reflect the fact that smokers with higher education and income levels travel abroad more often for vacations and work.<sup>27</sup>

## Limitations

Because cross-sectional data were used for this study, no conclusions on causal links between predictor variables and cross-border cigarette purchasing could be drawn.

Fieldwork periods differed across countries, and the mode of interviewing was different for most of the ITC Netherlands sample. Also, educational levels and income levels were only partly comparable across countries because of differences in educational systems and differences in income variables. However, we explored different categorisations of educational levels and income levels and these yielded comparable results. Therefore, we do not think this has influenced our results.

We assumed that smokers who reported frequently purchasing cigarettes outside their country did this intentionally to avoid taxes. Alternatively, these smokers may routinely travel to other countries in the normal course of their activities, for example, because they work across the border. Another issue is that we were not able to distinguish between legal tax avoidance and illegal tax evasion, because we did not ascertain the quantities of cigarettes imported. Future research should therefore assess cross-border cigarette purchasing in more detail, including quantities of cigarettes bought.

Living close to an open border with a country with lower cigarette prices was operationalised as living in certain border provinces/states. This is a very rough measure that is affected by the shape and size of the province/state. It would have been better to know the actual distance between respondents' homes and the country border. Also, because the number of respondents was low for some provinces/states, we could only provide an indication of regional variations.

## Future research

In this study, respondents were only asked whether they bought cigarettes outside their country and how often they did this. In

**Table 4** Multinomial logistic regression analysis of correlates of occasional and frequent categories of cross-border cigarette purchasing—no cross-border purchasing is reference category (n=7752)

	Occasional vs no cross-border purchasing OR (95% CI)	Frequent vs no cross-border purchasing OR (95% CI)
Gender		
Female	1.00	1.00
Male	1.10 (0.98 to 1.23)	1.07 (0.88 to 1.30)
Age group		
18–24	1.00	1.00
25–39	0.74 (0.61 to 0.90)**	0.71 (0.51 to 0.98)*
40–54	0.78 (0.66 to 0.93)**	0.58 (0.43 to 0.77)***
55 years and older	0.75 (0.64 to 0.89)***	0.77 (0.58 to 1.01)
Educational level		
Low	1.00	1.00
Moderate	1.23 (1.06 to 1.43)**	1.21 (0.93 to 1.57)
High	1.51 (1.30 to 1.76)***	1.36 (1.05 to 1.78)*
Income level		
Low	1.00	1.00
Moderate	1.25 (1.07 to 1.47)**	1.33 (1.02 to 1.73)*
High	1.87 (1.61 to 2.17)***	1.76 (1.36 to 2.27)***
No answer	1.16 (0.94 to 1.43)	1.08 (0.73 to 1.60)
Employment		
Unemployed	1.00	1.00
Employed	1.25 (1.09 to 1.42)***	1.19 (0.95 to 1.49)
Smoking status		
Daily smoker	1.00	1.00
Occasional smoker	0.68 (0.54 to 0.85)***	0.40 (0.24 to 0.68)***
Heaviness of smoking	0.99 (0.95 to 1.03)	1.11 (1.04 to 1.19)**
Intention to quit		
Not within 6 months	1.00	1.00
Within 6 months	0.94 (0.84 to 1.06)	0.62 (0.50 to 0.78)***
Smokes exclusively rolling tobacco		
Yes, exclusively rolling tobacco	1.00	1.00
No, factory made cigarettes or both	1.31 (1.13 to 1.53)***	0.81 (0.64 to 1.03)
Country and region		
The Netherlands	1.00	1.00
Border provinces of France	1.83 (1.34 to 2.48)***	12.42 (6.82 to 22.59)***
Non-border provinces of France	1.30 (0.96 to 1.76)	1.66 (0.86 to 3.21)
Border states of Germany	2.13 (1.53 to 2.96)***	6.42 (3.40 to 12.10)***
Non-border states of Germany	1.56 (1.16 to 2.08)**	1.77 (0.94 to 3.36)
Ireland	1.04 (0.75 to 1.44)	1.05 (0.50 to 2.21)
Scotland	0.85 (0.60 to 1.21)	1.54 (0.76 to 3.14)
UK (w/o Scotland)	1.66 (1.25 to 2.20)***	2.34 (1.28 to 4.29)**
Interviewing mode		
Telephone	1.00	1.00
Web	0.61 (0.46 to 0.82)***	0.60 (0.31 to 1.16)

\*p&lt;0.05.

\*\*p&lt;0.01.

\*\*\*p&lt;0.001.

future research, respondents should be interviewed in more detail about their cross-border shopping behaviours. Important questions are: why did they buy cigarettes abroad? Was buying cigarettes the goal of travelling to another country or were they abroad for other purposes such as vacation or work? In which country did they buy cigarettes? How many cigarettes did they buy, and how often? Did a friend or acquaintance buy cigarettes abroad for them or did they buy cigarettes for others? The answers to these questions could give more insight into the actual reasons behind socioeconomic and country differences in cross-border cigarette purchasing.

### Policy recommendations

Tobacco tax avoidance strategies, such as cross-border cigarette purchasing, may attenuate the impact of tax increases on tobacco consumption.<sup>4</sup> We found in our study that cross-border purchasing was most common in regions bordering countries that have considerably lower cigarette prices. Therefore, increasing tobacco taxes in countries with lower cigarette prices could help to limit cross-border shopping and help motivate smokers from both these countries and from their neighbouring countries to quit smoking.

The EU can also help to limit cross-border cigarette purchasing.<sup>7 28</sup> The EU is urged to implement policy measures to

reduce price differences between EU countries,<sup>28</sup> and also to reduce to 200 per person the number of cigarettes that can be legally imported for personal consumption, or 250 grams of rolling tobacco.<sup>7</sup> These measures make it less lucrative to cross the border for cheaper cigarettes.

## CONCLUSIONS

Cross-border cigarette purchasing was relatively common in French and German provinces/states that border countries with considerably lower cigarette prices (eg, Luxembourg, Spain and Poland). Twenty-four percent of smokers from these French provinces and 13% of smokers from these German states reported frequently purchasing cigarettes outside their country. In non-border regions of France and Germany and in Ireland, the UK and The Netherlands, frequently purchasing cigarettes outside the country was reported by only 2–7% of smokers. Cross-border cigarette purchasing is more prevalent among smokers with higher education and income. Increasing tobacco taxes in countries with lower cigarette prices, and reducing the number of cigarettes that can be legally imported across borders could help to limit cross-border purchasing by smokers from countries with higher cigarette prices.

### What this paper adds

- ▶ Cross-border cigarette purchasing was most common in French and German provinces/states bordering countries such as Luxembourg, Spain and Poland where cigarette prices are considerably lower.
- ▶ In non-border regions of France and Germany, Ireland, the UK and The Netherlands, few smokers reported crossing the border frequently to buy cigarettes.
- ▶ Cross-border cigarette purchasing was more prevalent among smokers with higher education and income.

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