



# TOBACCO TAXES IN THE EUROPEAN UNION

An evaluation of the effects of the European  
Commission's proposals for a new Tobacco Tax  
Directive on the markets for cigarettes and fine-cut  
tobacco

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## **ABSTRACT**

### **Background and Objectives**

Europe's Beating Cancer Plan aims to create a Tobacco-Free Generation—where less than 5 percent of the European Union's (EU) population uses tobacco—by the year 2040, with an intermediate goal of 20 percent in 2025. One of the key supranational policy levers for achieving these goals is the update of the EU's Tobacco Tax Directive. The European Commission was expected to launch a proposal for a revised Directive in December 2022, but this step in the legislative process was postponed until further notice; meanwhile, a full draft for a new Directive has circulated unofficially. The expectation of a new legislative framework at the EU level might have stopped some states from advancing tax reforms at the domestic level; however, the realization that a new Directive will not be available anytime soon could also prompt some states to act within the current legislative framework.

This study aims to contribute to the evidence base that must inform policy in these circumstances. It does so by first providing an overview of the current situation and recent evolution of retail prices for cigarettes and fine-cut tobacco in the bloc. Second, it presents an evaluation by means of model-based simulations of the effects on those outcomes and on market demand and excise revenue of the European Commission's aborted proposals for a new Directive. This evaluation highlights the opportunity cost of the delay in the legislative process as well as potential enhancements to the proposals from the point of view of tobacco control.

### **Methods**

The analysis is based on a panel database of prices, taxes, market volumes and sales for the EU member states over the period 2012–2022, which is supplemented with data on several other variables such as population, smoking prevalence, purchasing power parities, or inflation. The effects of tax changes are simulated by means of econometric models that produce country-specific estimates of prices, market volumes, market sales, and excise revenue.

### **Results**

The Commission's aborted proposals would affect all EU members except the six countries with the highest current tax rates (Denmark, Belgium, Finland, France, the Netherlands, and Ireland). The proposals would have a modest impact on price convergence and on affordability, yet they would not contribute significantly to a reduction in the gap between the prices of cigarettes and fine-cut tobacco.

Compared to a scenario where the tax parameters are kept constant at their 2023 values, the proposals would reduce the combined market demand for the two products in the bloc by between 3.3 percent in 2025 (the first year of implementation of the new Directive) and 4.1 percent in 2028 (the last year of the simulations horizon). Despite these reductions, excise revenue in the bloc would increase by between 8.5 percent in 2025 and 6.4 percent in 2028.

## **Conclusions**

The Commission's proposed revisions to the Tobacco Tax Directive are necessary. The sooner the legislative process is re-started the better. But they are also insufficient. Two modifications would enhance the public health value of a new Directive. First, is the removal of the asymmetric tax treatment of cigarettes and fine-cut tobacco, whereby the minimum tax applicable to the latter may be calculated as a fraction of the retail price, thus opening the possibility of undervaluation practices on behalf of the industry. Second, is an increase in the minimum tax per unit of product noted in the proposals to account for the surge in inflation experienced throughout the bloc in recent years.

There is scope for action by governments willing to prioritize tobacco control when setting domestic taxes and acting on this front is of paramount importance given the uncertainty about the date of enactment and contents of a revised Directive. The policy recommendations presented herein are useful in this regard, and the analytical tools developed in the process can be used to evaluate bespoke tax reforms at the country level.

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## List of Abbreviations

EU	European Union
FCT	fine-cut tobacco
LED	lowest excise duty
MET	minimum excise tax
p.p.	percentage points
TTD	Tobacco Tax Directive
WHO	World Health Organization

## Introduction

Numerous studies have assessed the performance of the European Union's (EU) Tobacco Tax Directive (TTD), formally known as Council Directive 2011/64/EU, since it entered into force on January 2011. In regard to its effects on public health, the general consensus is that the TTD and its predecessors have served well the objectives of maintaining a high level of health protection while ensuring the proper functioning of the internal market and securing appropriate levels of tax revenue for EU member states (Bouw, 2017). Indeed, the highest price levels for tobacco products across the world are found in the World Health Organization (WHO) European region, which includes the EU. Its common tax structure is seen as a powerful mechanism inducing member states to apply high domestic taxes and thus achieve such high prices (WHO, 2021).

Notwithstanding these beneficial effects, some studies have highlighted shortcomings that are particularly evident in the cases of factory-made cigarettes and fine-cut tobacco (FCT), which together account for roughly 95 percent of total sales of combustible tobacco and are therefore the most important products as far as public health is concerned. Two issues stand out: a wide variation in prices for the same product across member states and a substantial price gap between different products within member states (Branston et al., 2018; López-Nicolás and Stoklosa, 2018; Stoklosa, 2020). The European Commission, the executive branch of the EU, recognized these flaws in its own evaluation of the TTD, noting that the lack of convergence in prices creates an incentive for high levels of cross-border shopping, and that tax-induced price gaps promote substitution between cigarettes and FCT (European Commission, 2020). The European Council, the body that represents the governments of the member states, acknowledged these issues and urged the Commission to propose legislative reforms to address them, emphasizing the need for EU-wide action to reduce tobacco consumption (European Council, 2020). These threats to public health have been compounded by the inflationary trends experienced throughout the EU since 2021, which have eroded the real value of taxes (WHO, 2021).

The corrective EU-wide action requested by the European Council was to materialize in the form of a proposal for a new TTD, whose official release was expected by December 2022. Regrettably, this launch was postponed until further notice, even though a full draft for a new TTD has circulated unofficially (Smoke Free Partnership, 2022). It is difficult to assess the consequences of this turn of events for tobacco control. Renewing the TTD was one of the key actions in the roadmap for Europe's Beating Cancer Plan (European Commission, 2021). The expectation of a new legislative framework at the EU level might have stopped some states from

advancing tax reforms at the domestic level, and a delay in the TTD renewal process could reinforce their paralysis. On the other hand, the realization that a new TTD will not be available anytime soon could prompt some states to act within the current legislative framework.

This study aims to contribute to the evidence base that must inform policy in the context described above. It does so by first providing an overview of the current situation and recent evolution of retail prices for the two main combustible tobacco products, cigarettes and fine-cut tobacco (FCT) in the EU member states, focusing on affordability, cross-border price differences and possibilities of trading down. Second, the report presents an evaluation by means of model-based simulations of the effects of the European Commission's aborted proposals for a new TTD on those outcomes and on market demand and excise revenue. There is, of course, no guarantee that these proposals will be implemented when and if a new TTD is enacted. However, their evaluation is useful in the sense that it serves to highlight both the opportunity cost of the delay and potential enhancements to the proposals from the point of view of tobacco control. Moreover, the TTD defines the parameters for taxing tobacco products not only in the EU, but also in countries seeking to become members of the bloc. Thus, this evaluation will be helpful for potential future member states willing to make their tobacco tax policies consistent with the EU's.

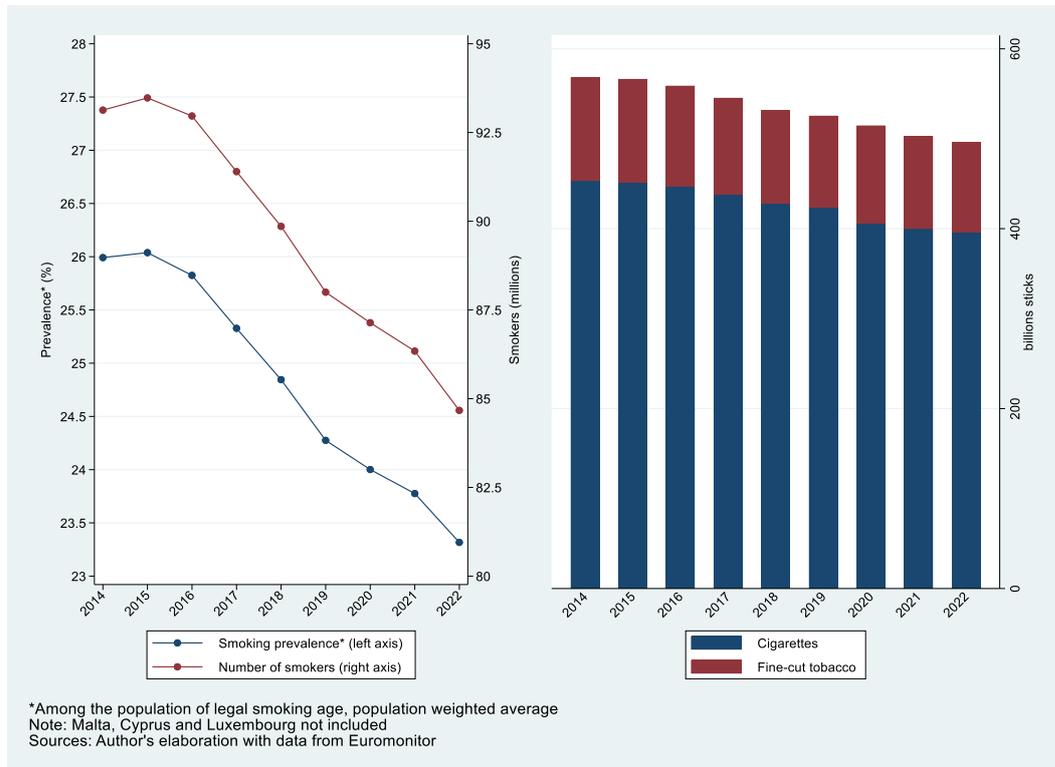
The structure of this report is as follows. Section 1 provides an overview of the recent evolution of retail prices and the current situation. Section 2 discusses the relationship between taxes and retail prices in the context of the European Union and presents the main innovations in the tax rules envisaged by the European Commission as per the unofficial draft of revisions to the TTD. Section 2 also contains an evaluation of the effects of these rules on the retail prices of cigarettes and FCT. Section 3 presents estimates of the corresponding effects on product demand and excise revenue. And Section 4 provides a summary and conclusion. The Appendix contains a discussion of the data sources and the modelling methods.

## 1. Overview of the Period 2014–2022

### Smoking prevalence and market volumes of cigarettes and fine-cut tobacco

Smoking prevalence in the bloc decreased by about 2.5 percentage points between 2014 and 2022, resulting in a total number of 84.6 million smokers at the end of the period, as shown in the left panel of Figure 1. The decreases in smoking are mirrored in the market volumes of cigarettes and fine-cut tobacco over the same period, presented in the right panel of Figure 1.

**Figure 1.** Smoking prevalence, number of smokers and market volumes in the EU, 2014–2022



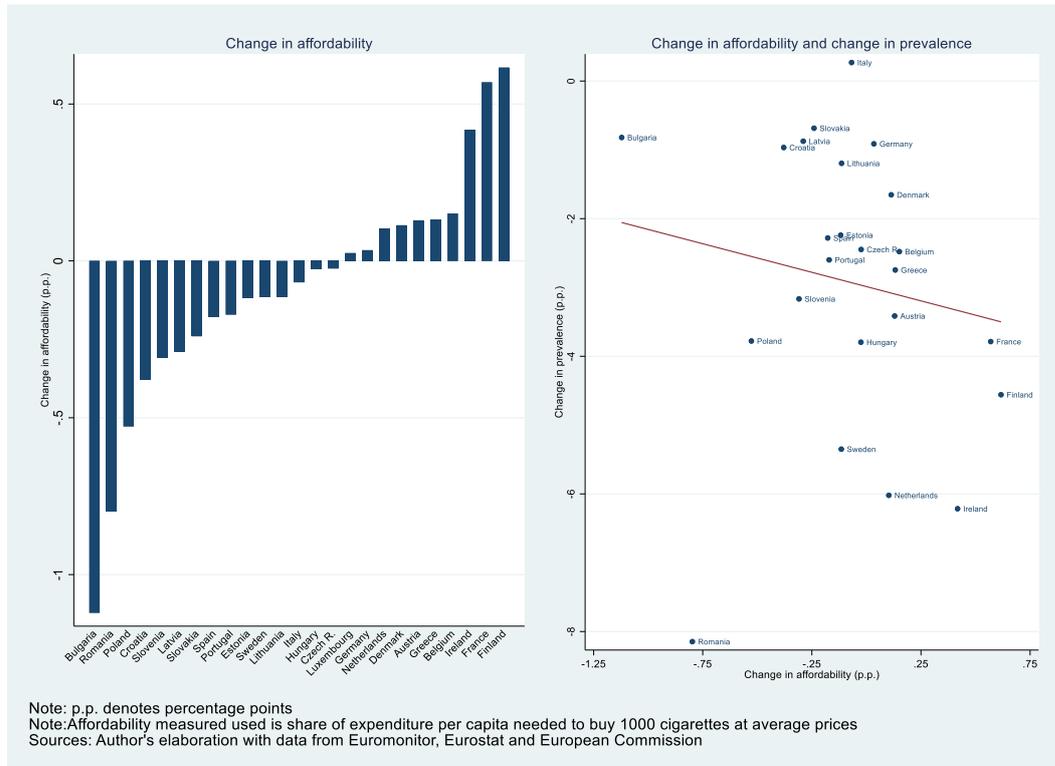
Although the tendencies in prevalence, smokers, and market volumes are encouraging, both figures suggest that the speed of reductions slowed down after 2019. In particular, smoking prevalence fell by 0.44 percentage points per year over 2015-2019 while over 2019-2022 the annual decrease was 0.32 percentage points. Likewise, the annual drop in the number of smokers fell from 1.28 million to 1.11 million per year and the drop in the combined volume of cigarettes and fine cut tobacco fell from 10.64 billion to 9.8 billion per year. This might jeopardize the ambitious objectives expressed in Europe’s Beating Cancer Plan, which aims to reduce smoking prevalence to 20 percent by 2025 and to less than 5 percent by 2040.

### Affordability

It is well documented in the literature (WHO, 2021) that the preventive effect of tobacco prices is eroded by both inflation and increases in consumer spending power unless tax policies include regular adjustments for these two factors. The left panel of Figure 2 shows the change in affordability of cigarettes over the period 2014–2022, which was characterized by remarkable improvements in economic performance among some of the bloc’s members (for example, nominal GDP per capita more than doubled in both Romania and Bulgaria) as well as a surge in inflation due to the impact on energy prices of the Russian invasion of Ukraine. Given these circumstances, it is not surprising that the affordability of cigarettes, measured in this case as

the share of expenditure<sup>1</sup> per capita needed to buy 1000 cigarettes at average prices,<sup>2</sup> increased substantially in some states.

**Figure 2.** Affordability and prevalence in EU, 2014–2022



The figure suggests a clear division between countries where cigarettes became more affordable—that is, eastern and southwestern EU member states—and other, mostly northwestern, member states where affordability decreased. Although it is not possible to attribute a causal nature to their relation, the right panel of Figure 2 shows that larger decreases in affordability were on average associated with larger reductions in smoking prevalence over this period.

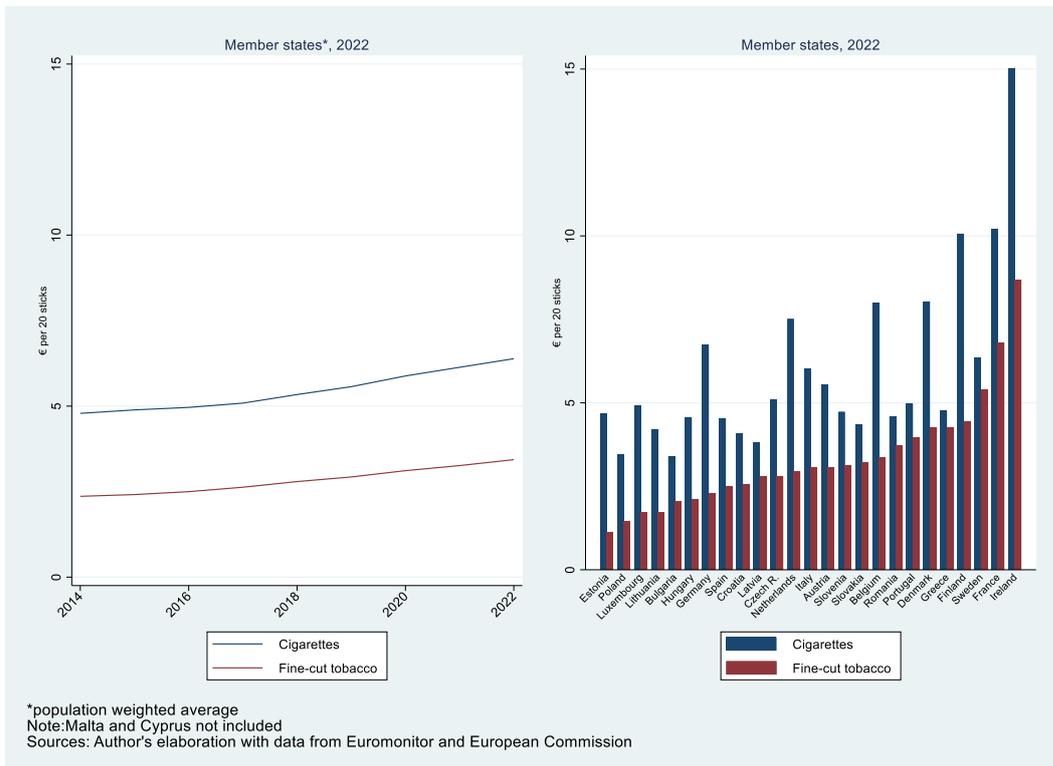
### Price gaps between cigarettes and fine-cut tobacco

The left panel in Figure 3 shows that the price gap between cigarettes and fine-cut tobacco in the bloc is persistent and, in recent years, widening.

<sup>1</sup> See the Appendix for a discussion on the use of consumer expenditure instead of gross domestic product in the computation of the affordability measure.

<sup>2</sup> The measure of retail prices for a tobacco product used throughout this study is the volume weighted average of retail prices across all the brands present in the corresponding market.

**Figure 3.** Prices of cigarettes and fine-cut tobacco in the EU

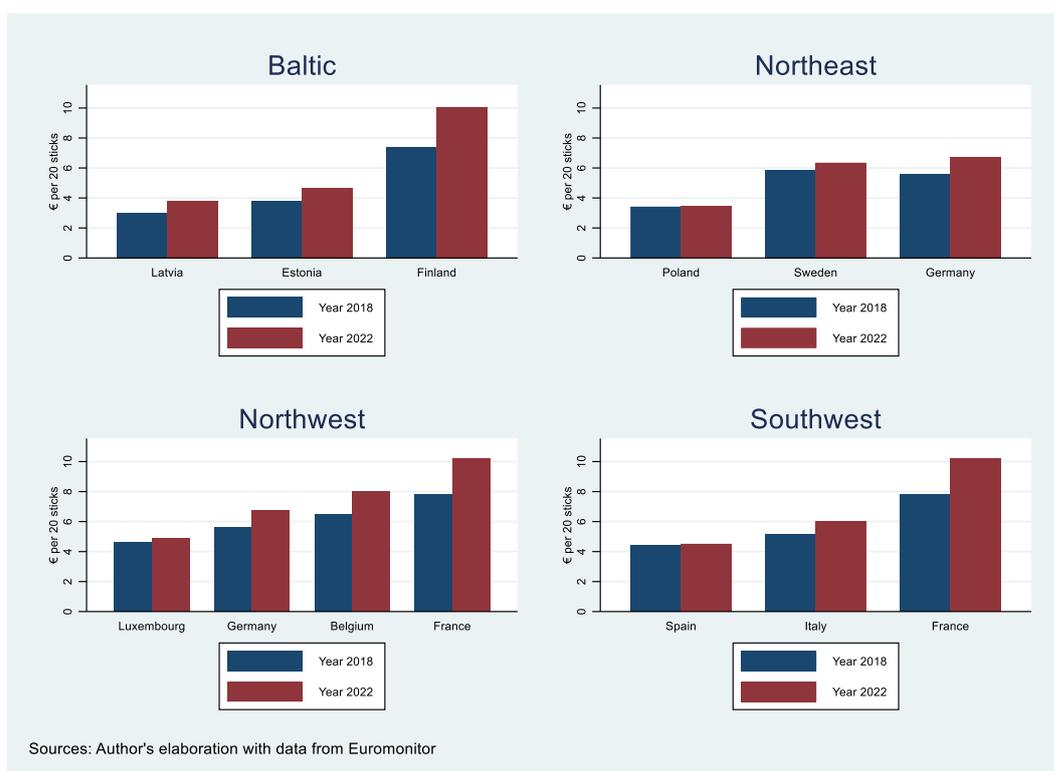


This growing price gap is a problem affecting all member states, as seen in the right panel, though in states such as Romania, Portugal, Greece, and Sweden, the gap is less important—both in absolute and relative terms—than in Germany, the Netherlands, Belgium, Finland, or Ireland.

### Cross-border price differences

Figure 4 shows the retail price of cigarettes in the countries belonging to four cross-border shopping “hotspots” reported in a study on the functioning of the general arrangements on excise duties in the internal EU market (PwC PricewaterhouseCoopers LLP, 2020).

**Figure 4.** Cross-border price differences of cigarettes in EU “hotspots,” 2018 and 2022



The study used price data for the year 2018 and, as Figure 4 shows with the latest available data, substantial differences persist to date. Moreover, the differences with respect to the country with the lowest prices in the hotspot have become even greater in the Baltic, Northwest, and Southwest hotspots. France, and Finland, which have the highest prices in these areas and are also the two countries where the affordability of cigarettes has decreased most in recent years, are likely to see their public health and fiscal outcomes adversely affected by these ever-larger price gaps.

## 2. Tax Structure and Retail Prices

### The mixed specific and ad valorem system with a minimum excise tax

The TTD governs the structure of the fiscal treatment of tobacco products in the EU, which belongs to the general class of “mixed specific and ad valorem excise with a minimum specific excise tax,” as per the WHO taxonomy (WHO, 2021). The tax base for the specific part is the physical quantity of product, while for the ad valorem part the tax base is its retail price. The sum of the specific and the ad valorem excises must be greater or equal than a minimum excise tax (MET hereafter) per quantity of product.

Within this general class, there are relevant differences in the rules applicable to cigarettes and the rest of tobacco products from the perspective of public health. In the case of cigarettes, it is

obligatory to use both a specific tax and an ad valorem tax, while for the rest of products member states may opt for using just one of the two types of taxes. Furthermore, in the case of cigarettes the TTD sets a lower bound for the MET that must exceed both a fixed monetary amount per quantity of product (€90 per 1000 units) and a percentage of the weighted average retail price (60 percent). Member states that raise an excise duty of at least €115 per 1000 cigarettes based on the weighted average retail price are waived from the latter condition (this is known as the “escape clause”). In addition, the specific component must reach at least 7.5 percent and be no more than 76.5 percent of the total tax burden raised based on the weighted average price. For the rest of tobacco products, the TTD sets a lower bound for the MET that must exceed either a fixed monetary amount per unit of product or a percentage of the average retail price. It is useful to name this rule as the “relative minimum clause” for future reference. In the case of FCT, the MET must exceed either €60 per kilogram or 48 percent of the weighted average retail price. Member states enjoy a high degree of autonomy at setting their domestic rates as far as these minima are respected.

The pros and cons of this class of tax structures for public health are well known (WHO, 2021). Using a fixed MET per quantity of product prevents price undervaluation, thus reducing the scope for the proliferation of low-priced brands. While the treatment of cigarettes fulfils this desideratum, the relative minimum clause applicable to the rest of tobacco products creates a loophole that may lead to undervaluation as a strategy for manufacturers to reduce their tax burden. A disadvantage of the fixed MET per quantity of product is that its value is eroded by inflation unless periodic adjustments are automatically applied. And, in the context of a 27-member political union with wide disparities in per capita income and price levels, another disadvantage of a fixed nominal MET per unit of product is that it does not allow for differences in purchasing power across countries (Branston and López-Nicolás, 2022). In current practice, however, most member states apply MET rates that exceed the current TTD minima and, to some extent, reflect their general economic conditions.

One of the most important effects of this tax structure from the point of view of public health is the creation of a price floor under which tobacco products would be sold at a loss. The term “lowest viable price” has been used to describe this floor as the price that would ensue in a hypothetical scenario where both producers’ revenue and retailers’ commissions are set to zero (Associati, 2019). Associated with a tax system’s lowest viable price is the lowest excise duty (LED hereafter). The LED is a useful metric because it subsumes the effects of the complex EU

tobacco tax system into an easily computable function of its key parameters.<sup>3</sup> For the case of cigarettes, Table 1 presents the 2023 values of such parameters<sup>4</sup> along with the values of the resulting LED. In order to illustrate the important effect of the use of a MET, the table also shows the value that the LED would attain if there were no such mechanism.

**Table 1.** Tax policy parameters for cigarettes in EU countries, 2023

	SPECIFIC	AD VALOREM	MET	LED	LED if MET = 0
Country					
Austria	73.00	0.33	157.98	157.98	120.85
Belgium	114.20	0.37	261.63	261.63	206.94
Bulgaria	55.73	0.25	90.50	101.95	79.61
Croatia	53.10	0.34	117.78	117.78	92.35
Czech R.	76.65	0.30	136.99	136.99	120.33
Denmark	260.23	0.01	0.00	263.52	263.52
Estonia	96.30	0.30	160.50	160.50	150.46
Finland	90.60	0.52	343.20	343.20	255.04
France	63.60	0.55	336.70	336.70	187.07
Germany	111.50	0.20	176.54	176.54	145.87
Greece	82.50	0.26	117.50	121.75	121.75
Hungary	69.43	0.24	98.38	99.84	99.84
Ireland	402.32	0.09	452.52	452.52	451.33
Italy	28.00	0.49	157.37	157.37	70.65
Latvia	104.00	0.15	135.90	135.90	127.06
Lithuania	79.60	0.25	130.00	130.00	114.12
Luxembourg	19.39	0.48	126.00	126.00	43.29
Netherlands	223.82	0.05	243.25	243.25	238.23
Poland	51.96	0.32	107.36	107.36	85.71
Portugal	112.50	0.12	143.03	143.03	131.95
Romania	92.86	0.13	120.26	120.26	109.84
Slovakia	79.60	0.23	124.30	124.30	111.72
Slovenia	84.11	0.23	131.00	131.00	116.31
Spain	24.70	0.51	131.50	131.50	64.51
Sweden	163.60	0.01	0.00	165.67	165.67

Note: All figures in € per 1000 cigarettes except AD VALOREM, which is expressed as a fraction of the retail price.  
Sources: Author's elaboration with data from the European Commission

The first three columns in Table 1 contain the values of the specific rate (€ per 1000 cigarettes), ad valorem rate (fraction of retail price) and the MET rate (€ per 1000 cigarettes). These three parameters are set directly by the tax authorities. The fourth column contains the resulting LED, and the fifth column shows the LED that the tax system would generate in the absence of a MET. As the table shows, there is substantial variation across the EU. For instance, Sweden and Denmark stand out for their option to use a high specific rate with a tiny ad valorem rate. These countries use an almost purely specific system, which makes unnecessary the application of a

<sup>3</sup> See the Appendix for details on the derivation of the lowest viable price and the LED.

<sup>4</sup> Although value-added taxes intervene in the determination of the LED, they are not shown in the table because they are not specific to tobacco products.

MET. The Netherlands and Ireland are similar in this regard, though their ad valorem rates are somewhat larger. In contrast, Spain, Italy, and Luxembourg use a system where the ad valorem component is more important. In the absence of a MET, there would be scope for marketing cigarettes with a much lower excise duty burden in these countries, as suggested by the figures in the fifth column.<sup>5</sup> Therefore, it is reasonable to assert that the MET is a crucial factor in harmonizing an otherwise very heterogeneous system in the direction of higher excise duties.

Notwithstanding the virtues of the system, the figures in Table 1 also explain the European Council's conclusion that action at the EU level is necessary so that "minimum excise duty rates regain traction in terms of making an effective contribution to reducing consumption of tobacco products," as the MET of €90 per 1000 cigarettes established by the TTD has been superseded by a substantial margin in most member states.

Table 2 presents the corresponding figures for fine-cut tobacco (FCT).

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<sup>5</sup> In the case of Spain, there is evidence documenting the remarkable effects in terms of compression of the lower tail of the price distribution after the introduction of a MET on cigarettes in 2006 (López-Nicolás, Badillo-Amador and Cobacho-Tornel, 2013; López-Nicolás, Cobacho and Fernández, 2013).

**Table 2.** Tax policy parameters for FCT in EU countries, 2023

	SPECIFIC	AD VALOREM	MET	LED	LED if MET = 0
Country					
Austria	0.00	0.56	140.00	140.00	0.00
Belgium	93.42	0.32	172.10	172.10	150.95
Bulgaria	77.71	0.00	0.00	77.71	77.71
Croatia	114.15	0.00	0.00	114.15	114.15
Czech R.	116.60	0.00	0.00	116.60	116.60
Denmark	208.53	0.00	0.00	208.53	208.53
Estonia	107.00	0.00	0.00	107.00	107.00
Finland	73.50	0.52	253.90	253.90	206.90
France	83.50	0.49	305.30	305.30	203.27
Germany	54.39	0.17	83.99	83.99	68.18
Greece	170.00	0.00	0.00	170.00	170.00
Hungary	61.10	0.00	0.00	61.10	61.10
Ireland	436.84	0.00	0.00	436.84	436.84
Italy	0.00	0.60	140.00	140.00	0.00
Latvia	91.90	0.00	0.00	91.90	91.90
Lithuania	104.60	0.00	0.00	104.60	104.60
Luxembourg	19.50	0.35	59.54	59.54	32.76
Netherlands	160.91	0.00	160.91	160.91	160.91
Poland	35.40	0.32	69.84	69.84	58.39
Portugal	87.00	0.15	188.00	188.00	106.65
Romania	110.89	0.00	0.00	110.89	110.89
Slovakia	95.30	0.00	0.00	95.30	95.30
Slovenia	51.00	0.37	109.00	109.00	92.93
Spain	23.50	0.41	98.75	98.75	47.21
Sweden	199.18	0.00	0.00	199.18	199.18

Note: All figures in € per 1000 grams except AD VALOREM, which is expressed as a fraction of the retail price.

Sources: Author's elaboration with data from the European Commission

The degree of disparity between the tax parameters of FCT is greater than that of cigarettes. Most member states use a pure specific system, and the rest use either a pure ad valorem with a MET or a mixed system with a MET. Again, for member states where the system is either purely or predominantly ad valorem, the MET is crucial at raising the LED. The case of Luxembourg in this table illustrates the earlier point about the loophole created by the relative minimum clause (that is, defining the minima applicable to FCT as either €60 per kilogram or 48 percent of the weighted average retail price in the corresponding member state). In 2022, the weighted average price of one kilogram of FCT in Luxembourg was €121.75, which would lead to a minimum of €58.44 per kilogram. With a domestic MET marginally above this limit, €59.54, Luxembourg turns out to have the lowest LED in the whole bloc.

### Lowest excise duties and retail prices

Another interesting feature of the LED as a summary of the characteristics of the tax system applied to tobacco products is its role in the determination of prices. The econometric evidence presented in the Appendix shows that LEDs, along with inflation and country fixed effects, can

explain the variation in the average retail prices of the two products. In view of these results, it is useful to connect the evidence about the evolution of prices in Section 1 with the evolution of the LEDs.

Start with the changes in the affordability of cigarettes shown in Figure 2. In seven out of the 15 member states where this product became more affordable between 2014 and 2022, there was a drop in the real value of the LED (Bulgaria, Poland, Spain, Portugal, Sweden, Italy, and Hungary). In the remaining member states, the change in the LED beat inflation but was not sufficient to raise prices enough to compensate for growth in expenditure per capita. In contrast, in the countries where affordability decreased most over the period, the real value of the LED increased substantially: Finland, 81 percent; France, 40 percent; and Ireland, 40 percent. These hikes raised retail prices enough to beat both inflation and expenditure growth.

Likewise, the persistent gap in the retail prices of cigarettes and FCT shown in Figure 3 can be traced back to the gap in the LEDs of the two products, whose (population-weighted) EU average on the basis of 20 sticks increased from €1.45 in 2011 to €1.65 in 2022, thus explaining the widening difference in retail prices seen in the graph.

Finally, the cross-border price differentials for cigarettes shown in Figure 4 reflect the differences in the countries' LEDs. For instance, based on 20 sticks in year 2022, in the southwestern hotspot these were: Spain, €2.63; Italy, €3.06; and France, €6.73.

The evidence shown in this section supports the idea that the most effective way to raise prices in the context of the EU tobacco tax system is to act on the LED. One possibility would be to increase the specific tax rate, as shown by Denmark and Sweden. Their case is not representative, however, since their system is practically a pure specific one, and it is unlikely that other member states would opt for reducing their ad valorem taxes to the negligible rates applied in these two countries. A more adequate option for most member states is to increase the rates for the MET. This is indeed the direction which the European Commission appears to have taken, as far as the contents of a draft<sup>6</sup> for a revised TTD (Draft Revised TTD hereafter) suggest. The next section discusses the main elements of the document in this regard.

### **The European Commission's proposals for a revised TTD**

The detailed explanatory memorandum in the Draft Revised TTD states that the European Commission proposes "moving from nominal rates to an approach partially based on purchasing

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<sup>6</sup> This draft was circulated unofficially in late 2022, after official sources announced that the release of the proposal for a revision of the TTD was postponed (Smoke Free Partnership, 2022). The document is available upon request.

power parities,” explicitly recognizing that nominal rates are inadequate from a tobacco control perspective, “as the combination of inflation and income growth results, over time, in a rapid erosion of the minima” and that “any nominal minimum rate set at the EU level is generally too low to have an impact on higher income countries.”

The way in which this shift is to be implemented consists of:

“[t]o replace the current approach whereby the EU minimum rate of excise duty is fully expressed in nominal terms by an approach whereby 2/3 of the tax is expressed in nominal terms and 1/3 in purchasing power parity terms”

and

“[t]o account for changes in purchasing power parities over time by automatically updating the EU minima applicable in each Member State every three years. A similar regular update is also proposed to encompass changes in the harmonised index of consumer prices.”

Articles 13, 17 and 21 in the Draft Revised TTD further specify the values of these minima.

In the case of cigarettes, the MET must reach at least 63 percent of the weighted average retail price and a nominal amount of  $\text{Rate}_{\text{MS}(t)}$  € per 1000 units. The new “escape clause” for cigarettes raises the threshold over which the first condition is waived to an excise of €230 per 1000 units based on the weighted average price. The lower and upper bounds for the ratio of the specific tax on the total tax burden at the weighted average price remain at 7.5 percent and 76.5 percent, respectively.

In the case of FCT, the MET must reach either 62 percent of the weighted average retail price or a nominal amount of  $\text{Rate}_{\text{MS}(t)}$  € per kilogram. Note thus that, by maintaining the relative minimum clause, the Draft Revised TTD does not remove the asymmetric treatment of the two products discussed in this report.

The value of the nominal amount is determined as follows,

$$\text{Rate}_{\text{MS}(t)} = 2/3 * \text{Rate}_{\text{EU}} + 1/3 * \text{Rate}_{\text{EU}} * \text{PLI}_{\text{MS}(t-1)} / 100$$

where

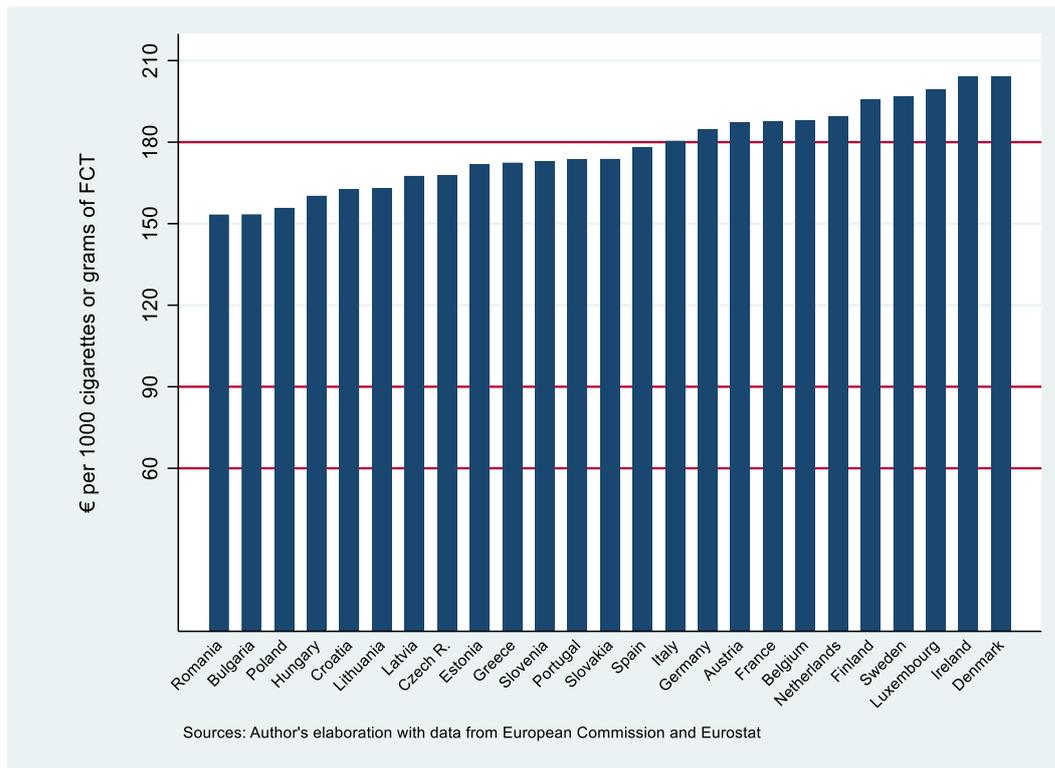
$\text{Rate}_{\text{EU}}$  = Initially set at €180, to be adjusted by the percentage change in the annual average value of the harmonized index of consumer prices as published by Eurostat (the EU statistical agency) over the preceding three calendar years.

$PLIMS_{(t-1)}$  = Price Level Index of the Member State elaborated by Eurostat in the year, one year prior to the year of adjustment.

The most innovative element for cigarettes and FCT is the replacement of a fixed nominal minimum for the MET applicable by member states with a minimum whose value is adjusted by purchasing power differences both across countries and by inflation. Moreover, this new lower bound for one cigarette is the same as for one gram of FCT. This is an improvement with respect to the current TTD, where the ratio is 3/2. But it is still far from the equivalence rate of 7/10 that would equalize the tax burden on the two products, which derives from the fact that in Europe one hand-rolled cigarette of FCT typically contains 0.7 grams of FCT (Gallus *et al.*, 2014).

Figure 5 presents the resulting country-specific minima (that is, the values of  $Rate_{MS}$ ). The red line at €180 represents the Commission’s proposal for the initial value of  $Rate_{EU}$ . The red lines at €90 and €60 represent the current TTD’s minima for cigarettes and FCT, respectively.

**Figure 5.** Country-specific minima for the MET ( $Rate_{MS}$ ) under Draft Revised TTD

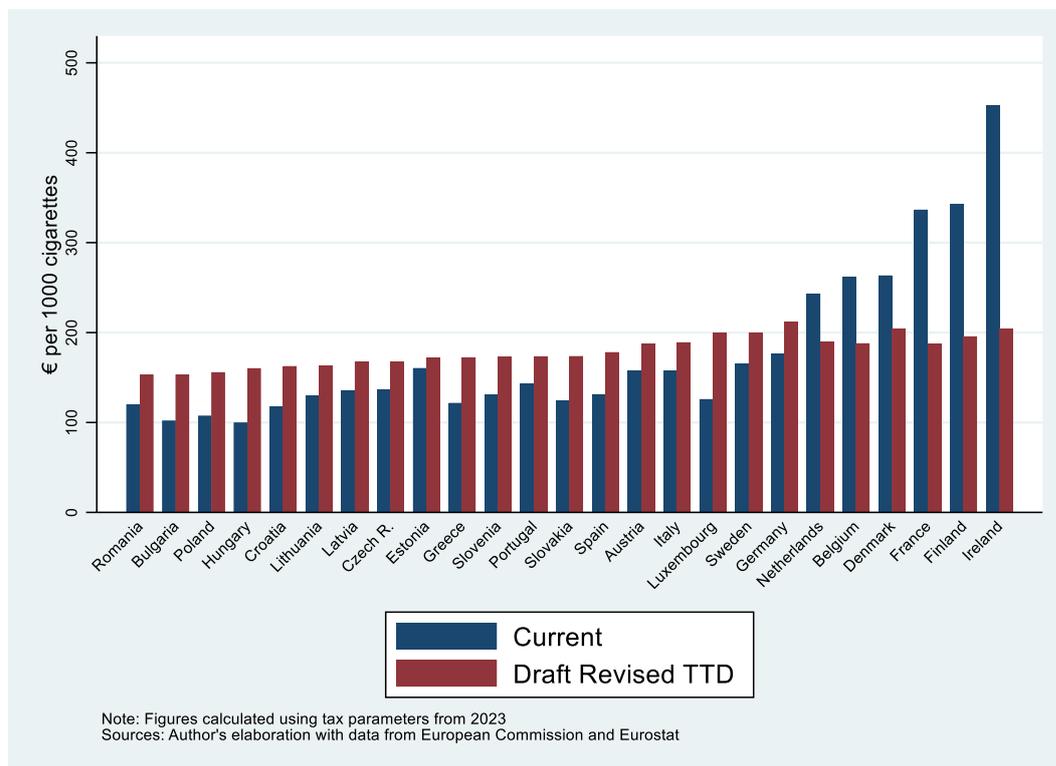


As shown in Figure 5, the Commission’s proposal would raise the minima applicable by member states by a noticeable margin in the case of cigarettes. A similar argument could be made about FCT, except for the fact that in the Commission’s proposal member states may continue applying the relative minimum clause. So in practice the power of these new minima is likely to be blunted, as we shall see in brief. Another remarkable result visible in the graph is that the

purchasing power parity adjustment achieves a degree of differentiation whereby the minima are larger in richer member states.

Figure 6 shows the effects of the Commission’s proposal on the resulting lower bound that the LED for cigarettes must attain in each member state (blue bars), keeping the rest of the tax parameters constant at their 2023 levels. The graph includes the current value of the LED in each of the tax systems for comparison (red bars).

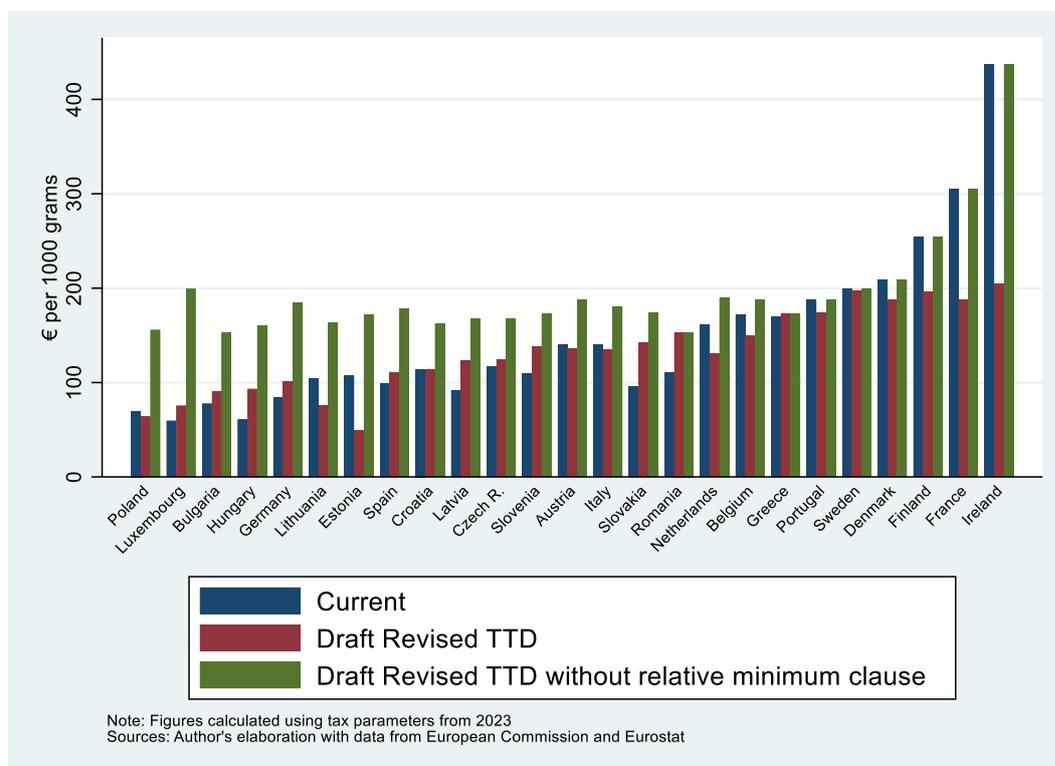
**Figure 6.** Effects of the Draft Revised TTD on the lowest excise duty (LED) of cigarettes



The proposal would generate raises in the LED in 19 out of the 25 states shown in the graph. In the remaining six, the current LED is above the level implied by the proposal—in some cases by large margins—such as in France, Finland, and Ireland.

Figure 7 shows the corresponding results for FCT. In this case the figure also contains the values of the lower bound for the LED that would result if the relative minimum clause was suppressed, that is, if the MET applicable to FCT was required to be at least equal to  $Rate_{MS}$  € per kilogram regardless of the value of the weighted average price (green bars).

**Figure 7.** Effects of the Draft Revised TTD on the lowest excise duty (LED) of FCT



Note first that the Commission's proposal would generate raises in the LEDs in 11 out of the 25 states, but the margins of such raises are in general small. In the case of Luxembourg, for instance, the increase would be €16 per kilogram.

If the relative minimum clause were removed, the increase would be €140 per kilogram. A similar result is found in most of the other 11 states where the proposal is binding. Therefore, removing the relative minimum clause would be a major step towards the harmonization of the tax regimes of cigarettes and FCT, and it is reasonable to argue that the price gap between the two products will not be bridged if the clause survives the revision of the TTD.

### 3. The Effects of the Commission's Proposals on Retail Prices

This section presents estimations of the effects of the Commission's proposals on retail prices compared to a baseline scenario. The estimations for both scenarios are based on the econometric models described in the Appendix, which relate retail prices to LEDs, inflation, time trends, and country fixed effects.

The baseline scenario, denoted current TTD scenario hereafter, maintains the current TTD with the tax parameters observed at the start of 2023. The alternative scenario consists of the application of the Commission’s proposals for cigarettes and FCT as per the Draft Revised TTD, which would operate as of year 2025, all else held equal. Estimations are obtained for a window of six years (2023–2028).

**Figure 8.** Evolution of retail prices of cigarettes and FCT in the EU in current TTD and Draft Revised TTD scenarios

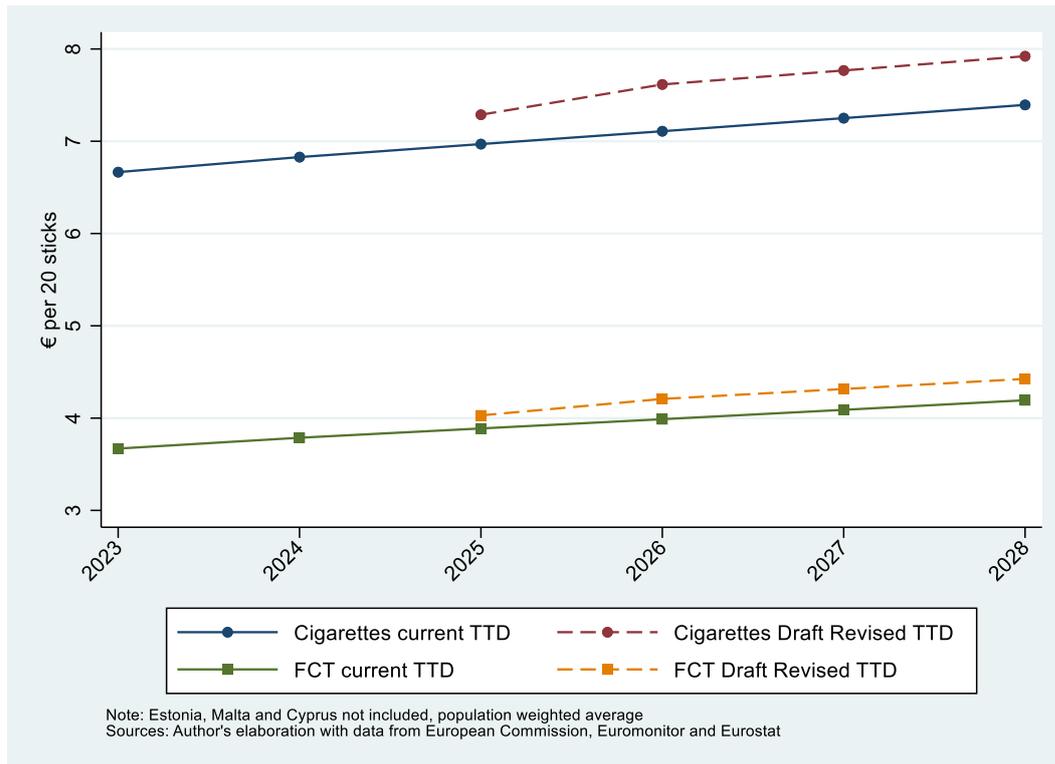


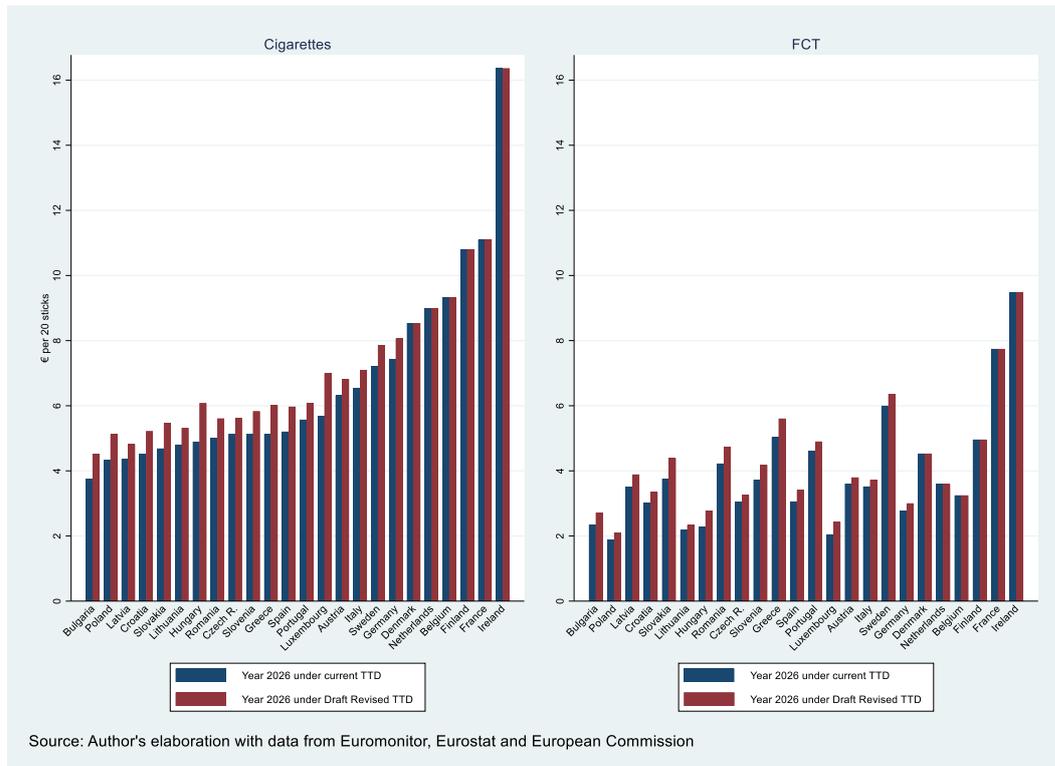
Figure 8 presents the evolution of retail prices for the two products in (population weighted) average terms for the bloc. Given that the effect of tax hikes is shifted to prices over a two-year period,<sup>7</sup> the full effect of the proposals would materialize in 2026. For cigarettes, this average effect amounts to about €0.50 per 20 sticks, while for FCT it would amount to €0.20 per 20 sticks. There is an important insight to be drawn from this figure, even if it shows average patterns: the Commission’s proposal, all else held equal, would not advance the closing of the price gap between these products. In fact, the gap would widen.

Average figures for the bloc do not fully represent the variety of effects at the state level. These are shown in Figure 9. The retail prices of cigarettes would increase in all countries except those

<sup>7</sup> See the Appendix for more details about this effect.

for which the proposals in the Draft Revised TTD are not binding, which, as we have seen earlier, are high-tax countries such as Ireland, France, Finland, the Netherlands, Belgium, and Denmark.

**Figure 9.** Retail prices of cigarettes and FCT in current TTD and Draft Revised TTD scenarios in year 2026

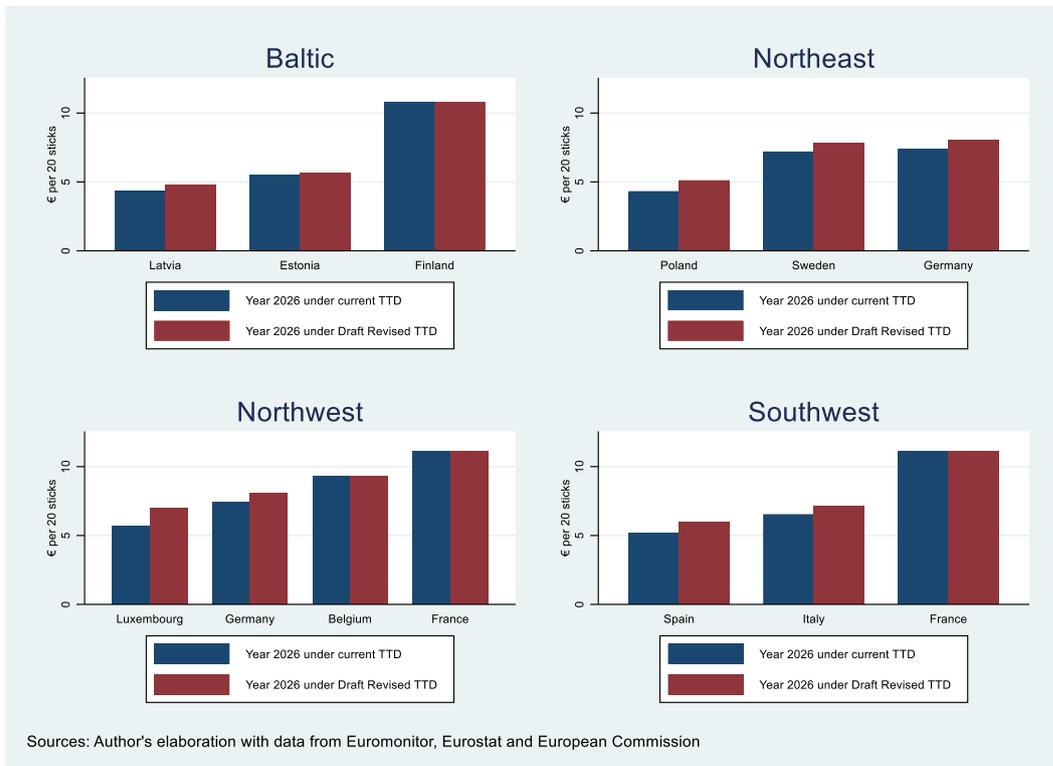


In the case of FCT, the effect of the Commission's proposals operates both directly—via the increase in the LED on FCT in the countries where the proposals are binding—and indirectly, via the increase in the LED on cigarettes.<sup>8</sup> This means that FCT prices would increase not only in the 11 countries subject to the direct effect but also in other countries such as Austria, Italy, Portugal, and Sweden, where only the indirect effect takes place.

These changes contribute to the desideratum of price convergence. By year 2026, the standard deviations of prices in the baseline scenario are €2.86 and €1.78 for cigarettes and FCT, respectively, while in the Commission's proposed scenario they would be €2.62 and €1.73, respectively.

<sup>8</sup> See the Appendix for more details about this effect.

**Figure 10.** Cross-border cigarettes price differences in current TTD and Draft Revised TTD scenarios in year 2026



These are modest improvements, however, at least in the sense that the cross-border cigarette price gaps in the four “hotspots” reported in Section 1 would not differ much across the two scenarios by year 2026, as shown in Figure 10. Regarding FCT, the projections for retail prices in France’s land neighbors, shown in Figure 11, are particularly worth noting and highlight the limits of the Commission’s proposals when it comes to solving the cross-border trade flow issues.

**Figure 11.** Cross-border FCT price differences around France in current TTD and Draft Revised TTD scenarios in year 2026

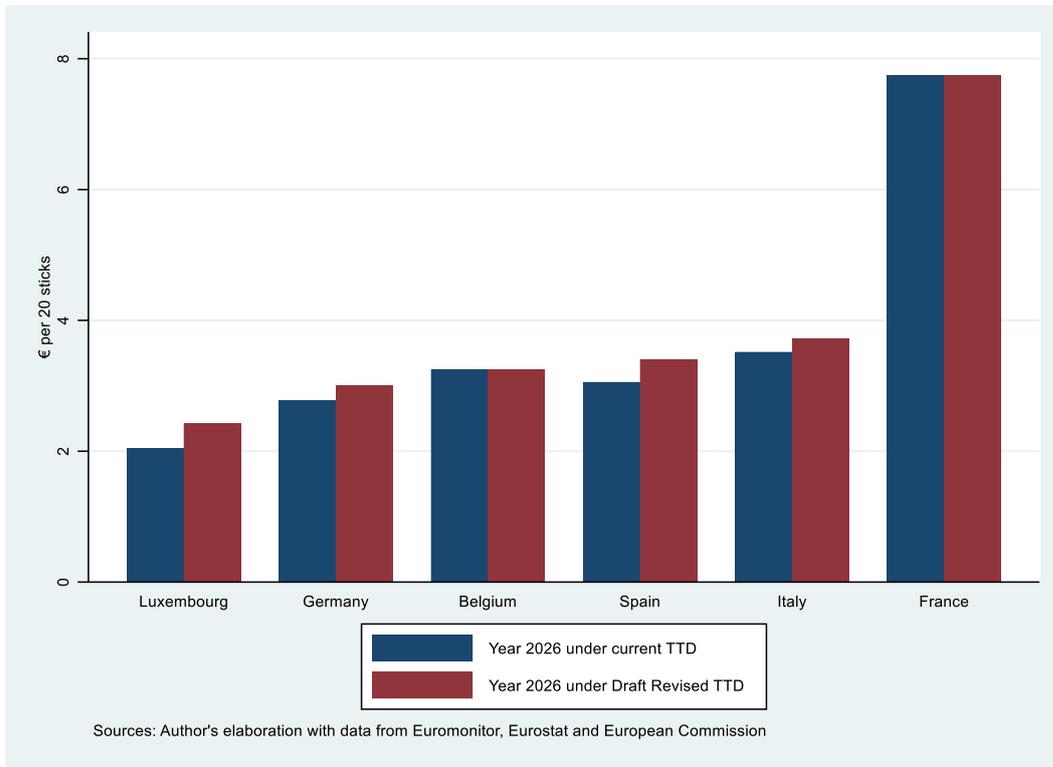
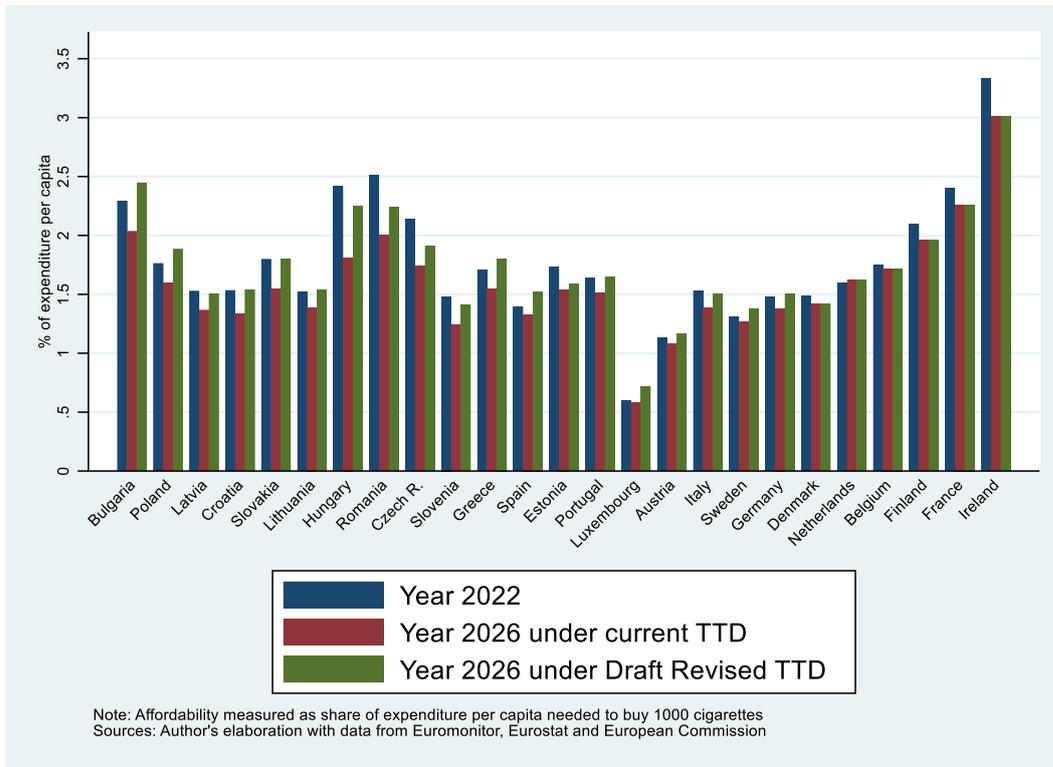


Figure 12 presents the effects of the proposals on the affordability of cigarettes. Note first that, in the current TTD scenario, by 2026 cigarettes would be more affordable than in 2022 in all states but the Netherlands. If the Commission’s proposals were implemented, the effects on this metric would be modest, as they would only restore the affordability levels of 2022 for eight states (Bulgaria, Poland, Greece, Spain, Austria, Sweden, Luxembourg, and Germany). Note however that, in most of these states, affordability increased during the late 2010s (Figure 2).

**Figure 12.** Affordability of cigarettes in year 2022 in current TTD and Draft Revised TTD scenarios in year 2026



In the rest of states where the proposals are binding, they would fall short of preserving the affordability levels of 2022, although they would partly compensate for the downward slide in the relative cost of cigarettes that would ensue in the baseline scenario.

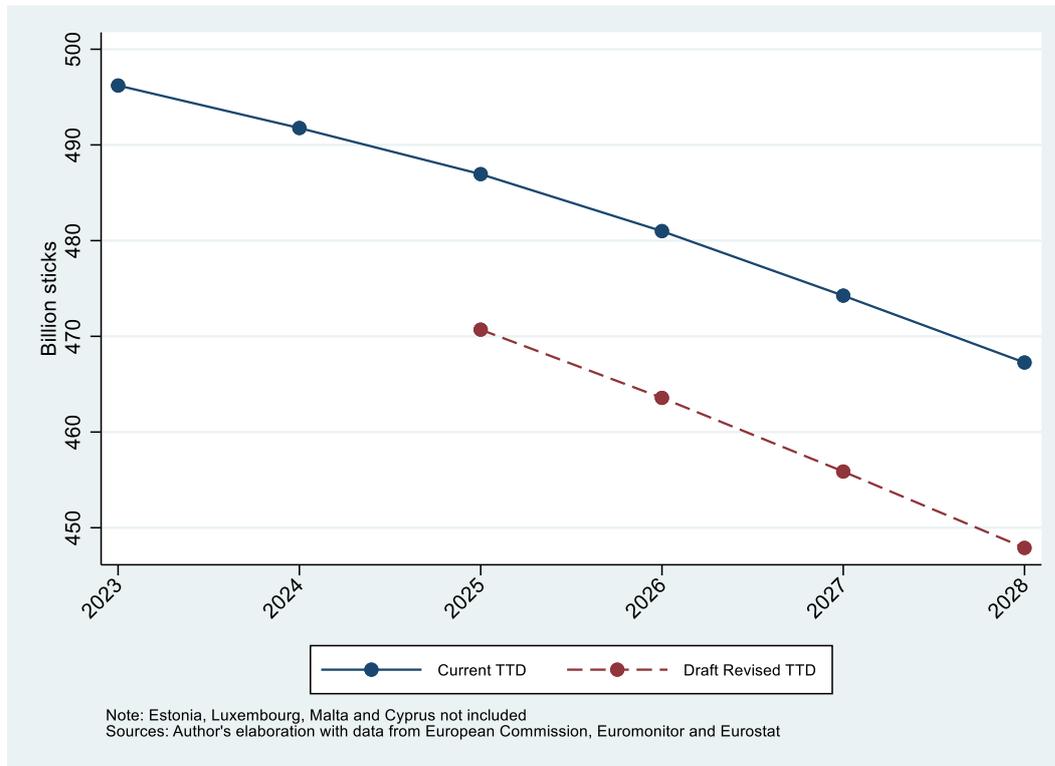
This suggests that the nominal minimum rate of €180 per 1000 cigarettes proposed in the Draft Revised TTD should be updated to compensate for at least the surge in consumer prices across the bloc. Inflation projections for the EU for years 2023 and 2024 are 6.4 percent and 3.1 percent, respectively. This means that, by 2025, the year on which the new TTD is supposed to be in force, the real value of the nominal minimum rate would have decreased by nearly one tenth.

#### 4. Effects of the Commission’s Proposals on Product Demand and Tax Revenue

In this section, we discuss the estimates of the effects of the Commission’s proposals on the demand for cigarettes and FCT and on excise revenue from these products. The estimates are based on the price effects presented in the previous section and on the econometric two-stage model of demand for combustible tobacco products discussed in the Appendix.

Figure 13 shows the evolution of the aggregate demand of cigarettes and FCT under the current TTD baseline scenario and the Draft Revised TTD scenario.

**Figure 13.** Evolution of EU market volumes for cigarettes and FCT in current TTD and Draft Revised TTD scenarios

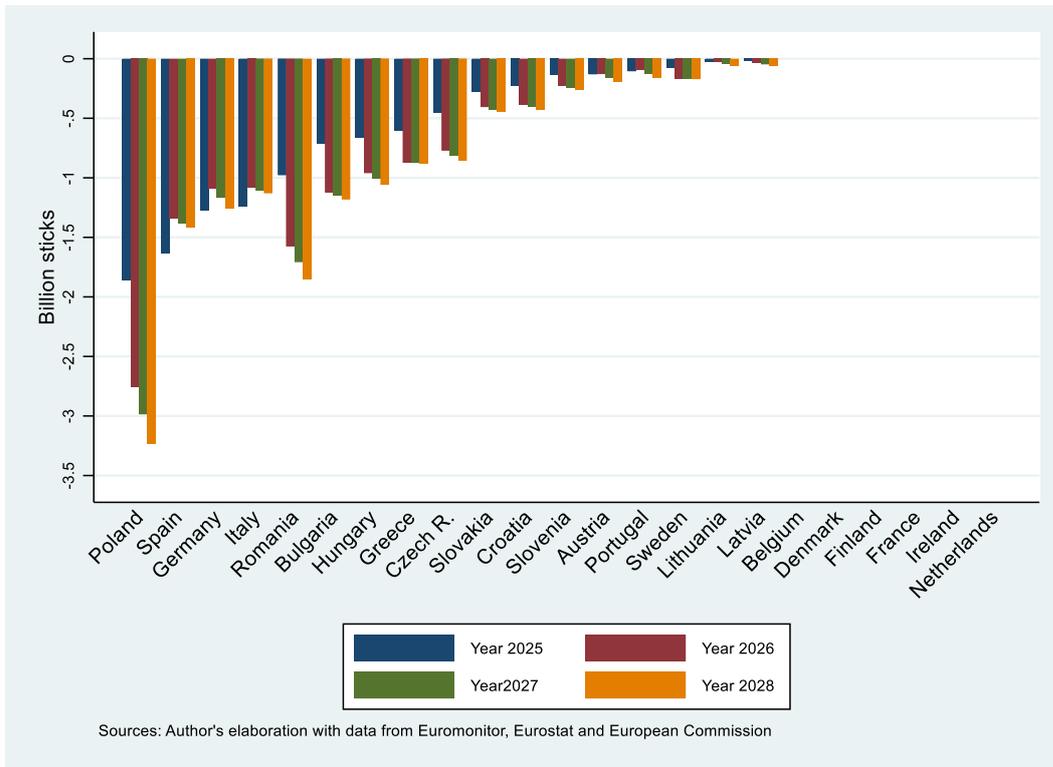


Note first that demand for these products is projected to decline. This pattern reflects the decline in consumption of combustibles in the EU shown in Section 1. Thus, in 2028, demand for the two products in the baseline would be 29 billion sticks smaller than in 2023. If the Commissions' proposals were implemented, there would be a further decline of 19.4 billion sticks.

Figures 14–15 show the corresponding results at the country level separately for cigarettes and FCT. In this case, the figures show the changes in demand on each of the years from 2025, the year in which the proposals would be enforced, to 2028. As discussed earlier, the Commission's proposals are not binding for Belgium, Denmark, Finland, France, the Netherlands, and Ireland, so there would be no change in demand for these countries with respect to the baseline.

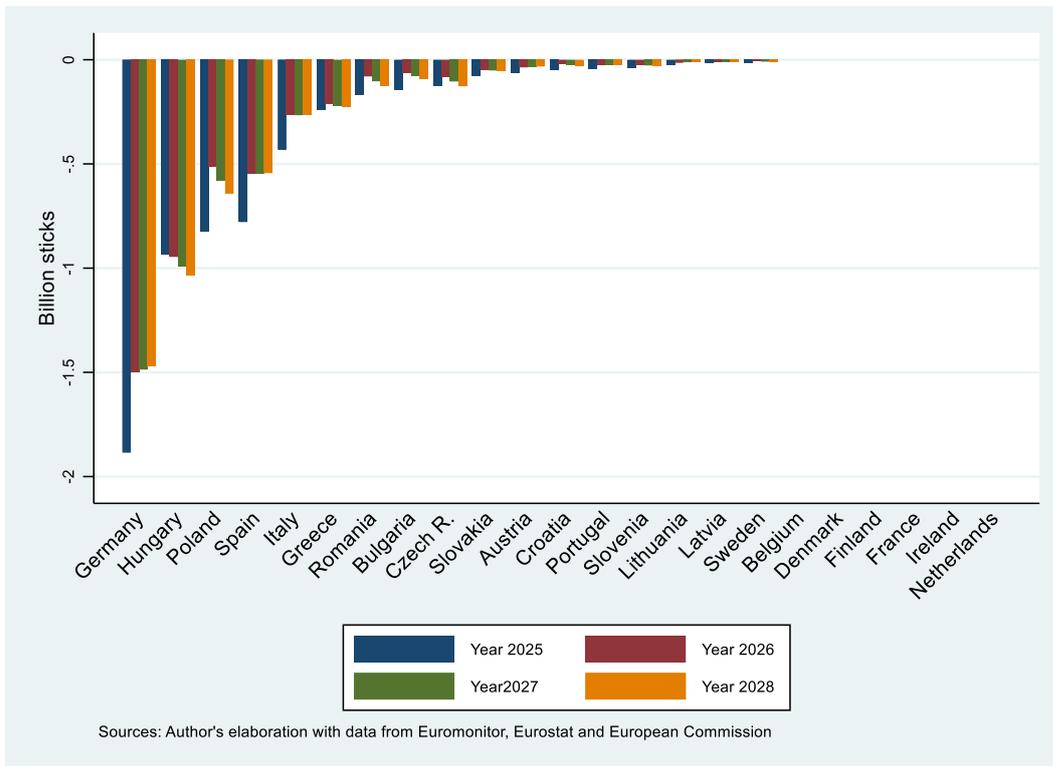
The decline in cigarette volume would be largest in Poland where, by 2028, around 3.25 billion fewer sticks would be consumed because of the reforms proposed in the Draft Revised TTD.

**Figure 14.** Change in cigarette market volumes under Draft Revised TTD in years 2025–2028



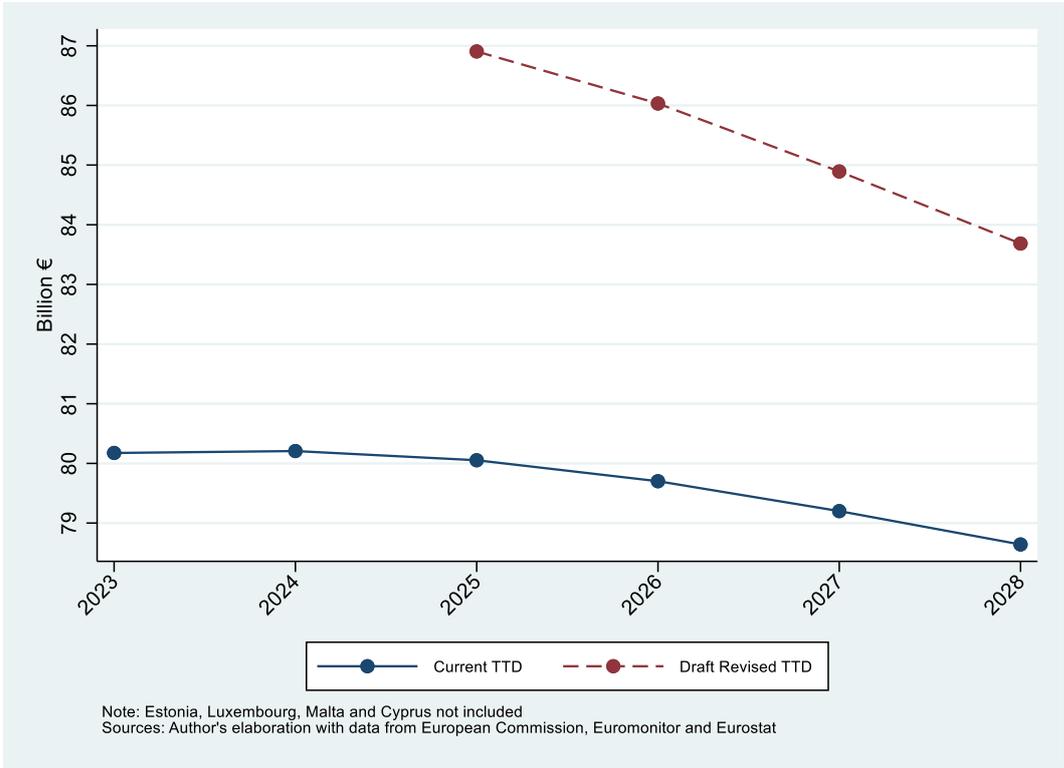
The decline in demand for FCT would be greatest in Germany, with around 1.75 billion fewer sticks consumed by 2025.

**Figure 15.** Change in FCT market volumes under Draft Revised TTD in years 2025–2028



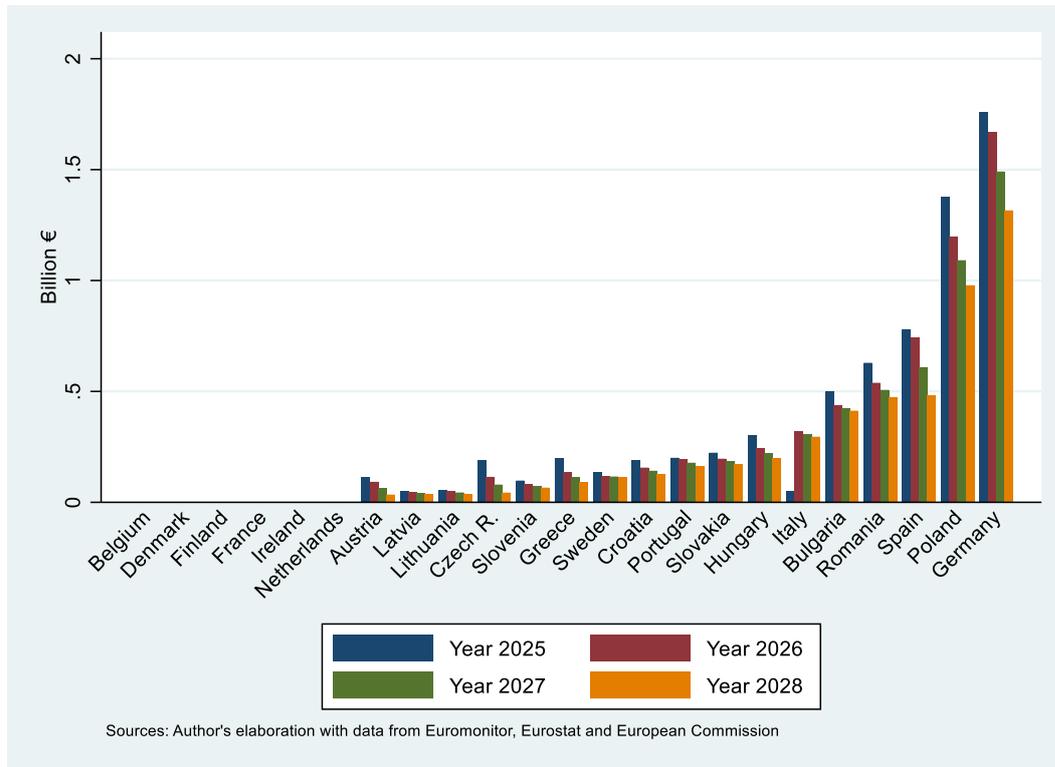
As shown in Figure 16, the Commission’s proposals would increase excise revenue from these two products, as might be expected given their price-inelastic nature. The aggregate effect would amount to an increase of €7 billion in 2025 with respect to the baseline scenario. The net increase persists over the simulation horizon, though its size diminishes gradually. In 2028, the increase in revenue with respect to the baseline is €5.25 billion.

**Figure 16.** Evolution of excise revenue from cigarettes and FCT in current TTD and Draft Revised TTD scenarios



At the country level, the largest increases in tax revenue would be attained in Poland and Germany, as seen in Figure 17.

**Figure 17.** Change in excise revenue from cigarettes and FCT under Draft Revised TTD in years 2025–2028



## 5. Summary and Conclusions

Smoking prevalence in the population of legal smoking age in the EU stood at 23.5 percent in 2022, down 2.5 percentage points since 2014. Although this declining trend is encouraging, the pace of reduction might be insufficient to reach the 20 percent objective by 2025 set in Europe’s Beating Cancer Plan. There are several factors weighing against the likelihood of fulfilling this objective. FCT costs half as much as cigarettes on average in the bloc, and the price gap between the two appears to have increased in recent years. Likewise, there are large cross-border price differences in several regions all over the EU for both cigarettes and FCT, which undermine the tobacco control efforts of high-tax countries. More recently, because of both increasing incomes and the erosive action of the bouts of inflation that have affected the bloc, these products have become more affordable in most member states.

The tobacco control community expected the update of the EU’s Tobacco Tax Directive to contribute to the correction of these factors. Such expectation rests on the well documented fact that the EU’s minimum taxes per unit of product generate a price floor below which it is unprofitable to sell tobacco products. Judging by the unofficial document containing the European Commission’s draft for a new Directive, the proposed update seeks to raise minimum rates to promote price convergence between countries and products. The key innovations in

this regard are the adjustment of minimum tax rates to differences in purchasing power across countries, their periodic update for inflation and the use of the same minimum rate on 1,000 grams of FCT as on 1,000 cigarettes. Although the process of policy reform has been postponed, and it is uncertain whether and when these measures will be enacted, their evaluation offers useful evidence highlighting both the opportunity cost of the delay in the policy process and some areas where improvements might still be introduced to strengthen tobacco control efforts.

The Commission's proposals would affect all EU members except the six states with the highest current tax rates (Denmark, Belgium, Finland, France, the Netherlands, and Ireland). The magnitude of the resulting price increases is modest. Compared to a baseline scenario that preserves the tax rates and rules of 2023, the enactment of the Commission's proposals would result in an increase of €0.5 per 20 sticks for cigarettes and €0.2 per 20 sticks for FCT by year 2026, on average, in the bloc.

This suggests that the Commission's proposals per se would not contribute to a reduction of the price gap between cigarettes and FCT. Indeed, these estimated effects indicate the possibility of a widening of the gap, in the absence of other measures. In this regard, it is unfortunate that the proposals do not correct an asymmetry in the treatment of cigarettes and FCT that accounts for an important part of the difference in the fiscal burden of the two products. While taxes on cigarettes must satisfy both an absolute minimum condition and a relative minimum condition, FCT taxes must satisfy either an absolute minimum or a relative minimum. Removing this relative minimum clause would be a major step towards the harmonization of the tax regimes of cigarettes and FCT, and it is reasonable to argue that the price gap between the two products will not be bridged if the clause survives the revision of the TTD.

The price increases in the Commission's proposed scenario would contribute modestly to the objective of price convergence. By 2026, the distribution of prices for 20 cigarettes (FCT sticks) would have a standard deviation €0.24 (€0.05) smaller than in the baseline scenario. However, these effects are too small to solve the issue of cross-border price differences. The Commission's proposals for minimum rates contain an automatic adjustment for changes in purchasing power parity, which in principle means that differences in tax burdens would diminish as economies converge. This is a welcome innovation, but it is hard to imagine that this mechanism alone can over time alleviate cross-border price differences. Proof of the contrary is the fact that, even allowing for such adjustment, the retail prices of cigarettes and FCT in Luxembourg—the country with the third-highest purchasing power parity in the bloc according to Eurostat—would still be substantially lower than in countries with lower parities such as Germany, Belgium, or France.

The effects of the Commission's proposals on product affordability are positive in the sense that, in their absence, the cost of 1000 cigarettes relative to expenditure per capita would continue the downward slide experienced recently in many countries in the bloc. But, by 2026, the proposals would restore cigarette affordability to its 2022 level in only eight states. The automatic adjustment of minimum taxes with inflation contained in the proposals is again welcome, but additional measures would be necessary to return to the affordability levels of the mid-2010s.

The estimated effects of the price increases associated with the Commission's proposals on the combined market demand for the two products amount to a reduction that oscillates between 3.3 percent in 2025 and 4.1 percent in 2028. These effects would add to a general declining trend in demand. By the end of the evaluation horizon, year 2028, projected market demand for the bloc in the baseline scenario would be 5.8 percent smaller than in 2023. The Commission's proposals would add four percentage points to this reduction. Despite these reductions in demand, and due to the price inelastic nature of tobacco products, excise revenue would increase by between 8.5 percent in 2025 and 6.4 percent in 2028. In view of these results, it is reasonable to argue that the Commission's proposals are necessary. The proposals would lead to a reduction in demand for cigarettes and FCT, and, at the same time, they would increase excise revenue. The sooner the policy process for the update of the TTD is re-started the better.

While necessary, the proposals are also insufficient. Keeping the asymmetry in the treatment of cigarettes and FCT is hardly understandable from a public health point of view. Likewise, the modest effects of the proposals on affordability suggest that the nominal minimum contained in the proposal should be raised—even more so the longer the policy process for the renewal of the TTD is delayed—lest inflation erodes such effects into insignificance. These are two obvious focus points for improvement in the Commission's proposals.

Aside from these recommendations, it is useful to note that the EU's legislation on tobacco taxes can be complemented with domestic policies that develop its full potential. In this sense, there is scope for action by governments willing to prioritize tobacco control when setting domestic taxes, and acting on this front is of paramount importance given the uncertainty about the date of enactment and contents of a revised TTD. The legislation currently in force allows member states to eliminate the asymmetry in the treatment of cigarettes and FCT when setting domestic rates, by using an absolute minimum rate condition, and closing the gap in the value of such rate with respect to the corresponding rate for cigarettes. Likewise, governments may introduce mechanisms that compensate for changes in product affordability arising from either inflation

or increases in income per capita, or both. Perhaps the unofficial circulation of the Commission's plans inspires member states' governments to enhance their current tax stance on cigarettes and FCT. The policy evaluation results presented herein should be useful in this regard, and the analytical tools developed in the process can also be used to evaluate bespoke tax reforms at the country level.

## Appendix

### Data

The results presented in this report are based on data on smoking prevalence; tobacco tax rates and value added tax rates; the volume weighted average prices for cigarettes, fine-cut tobacco, cigarillos, cigars and pipe tobacco; a general consumption price index and an index reflecting purchasing power differences across countries; and aggregate consumer expenditure, population and inflation. The analysis is carried out at the member state level, from which EU aggregates may be computed. Results are not available for Malta and Cyprus due to lack of data. Incomplete data for Estonia and Luxembourg precludes their inclusion in the analysis of the demand and revenue effects of the tax reforms and, only in the case of Estonia, the effects of tax reforms on the price of FCT.

The sources for these data are:

#### **The European Commission's Taxes in Europe Database** (European Commission, 2023)

- Tax rates for all EU member countries. Yearly data for period 2011–2023.
- For Luxembourg, the weighted average price of cigarettes and fine-cut tobacco. Yearly data for period 2011–2022.
- For Estonia, the weighted average price of cigarettes. Yearly data for period 2011–2022.

#### **Eurostat** (*Eurostat*, 2023)

- Harmonized Index of Consumer Prices for all EU member countries. Yearly data for period 2011–2022.
- Comparative Price Levels for all EU member countries. Year 2021

#### **Euromonitor International Passport Database** (Euromonitor International, 2023)

- Smoking prevalence and legal market volumes and sales of cigarettes, fine-cut tobacco, cigarillos, cigars and pipe tobacco for all EU member states except, Malta, Cyprus and Luxembourg. Yearly data for period 2011–2022.
- Aggregate consumer expenditure and population. Yearly data for period 2011–2022.
- Forecast values for consumer expenditure, population, and consumer prices inflation. Yearly data for period 2023–2028.

Values for the weighted average price of tobacco products are computed by dividing sales by market volumes. In the case of both cigarettes and FCT market volumes are expressed in terms of sticks. For the latter, one stick is assumed to contain 0.7 grams of FCT.

### Affordability metric

The measure of affordability used in this report is a variation of the well-known relative income price (RIP) of Blecher and van Walbeek (Blecher and Walbeek, 2004) where, instead of gross domestic product (GDP) per capita, consumer expenditure per capita is used as the denominator in the calculation of the price of 1000 cigarettes relative to consumption possibilities. This variation is motivated by the fact that gross domestic product in some EU countries is unduly affected by the concentration of foreign multinationals whose net income is computed as part of GDP but is nonetheless distributed to non-domestic shareholders. The case of Ireland is the clearest example. In 2022, the ratio of consumer expenditure to GDP in Ireland was 22 percent, which is two standard deviations below the mean of 55 percent for the 25 states considered in this study. Another reason for this methodological variation is the fact that consumer expenditure tends to be smoothed out through economic booms and busts, therefore making the metric used here less sensitive to the distortions in GDP caused by the COVID-19 pandemic than the original RIP.

### The structure of the retail price of tobacco products

The retail price  $P$  for a tobacco product in the EU is given by the following expression (Agencia Tributaria, 2015):

$$P = q + e + aP + i(q + e + aP) + cP,$$

where

$q$  = producer's price

$e$  = specific tax rate

$a$  = ad valorem tax rate

$i$  = VAT rate

$c$  = retailer's margin.

For a given minimum excise tax (MET) of  $D$  monetary units per unit of product, the following condition must hold

$$e + aP \geq D.$$

From these expressions, the lowest viable price is defined by setting  $q = c = 0$  to obtain

$$P = e(1+i) / (1 - a(1+i)); \text{ if } e + aP > D$$

$$P = D + iD \quad ; \text{ otherwise.}$$

Therefore, the lowest viable excise duty (LED) is given by

$$\text{LED} = e(1 + (a(1+i) / (1 - a(1+i)))) ; \text{ if } e + aP > D$$

$$\text{LED} = D \quad ; \text{ otherwise.}$$

### The effect of taxes on retail prices

Table A1 presents the results of econometric models for the weighted average price of cigarettes and of FCT as functions of their LEDs and their specific and ad valorem tax rates. The specifications also include the rate of inflation, a linear time trend, country fixed effects, and a first order autoregressive disturbance term. They are estimated on a panel of yearly observations for 25 member states (EU27 except Malta and Cyprus) from 2012–2022 (Croatia since 2015). The models for FCT exclude Estonia due to inconsistencies in the series on the price of this product.

The dependent variable is in logarithms, so the effects of the explanatory variables are either elasticities (proportional change in prices associated with a one-percent change in the explanatory variable when the latter is expressed in logarithms) or semi-elasticities (proportional change in prices when the explanatory variable increases by one unit if the latter is expressed in levels). The LED variables and specific tax rates are expressed in logarithms, so their coefficients are to be interpreted as tax pass-through elasticities, and they include both their contemporaneous value and one lag. The rest of the explanatory variables are in levels. Asterisks are used to indicate the level of statistical significance of the estimates.

**Table A1.** Fixed effects regression models for retail prices, 2012–2022

	Log price cigarettes (Model 1)	Log price FCT (Model 2)	Log price cigarettes (Model 3)	Log price FCT (Model 4)	Log price cigarettes (Model 5)	Log price FCT (Model 6)
Log LED cigarettes t	0.253*** (0.053)	0.151* (0.081)	0.287*** (0.049)	0.198*** (0.075)	0.307*** (0.050)	0.212*** (0.078)
Log LED cigarettes t-1	0.163***	0.057	0.161***	0.107	0.162***	0.091

	(0.046)	(0.071)	(0.044)	(0.067)	(0.046)	(0.069)
Log LED FCT t	0.013	0.076	0.022	0.104**	0.022	0.110**
	(0.037)	(0.058)	(0.030)	(0.045)	(0.031)	(0.047)
Log LED FCT t-1	-0.013	0.051	-0.011	0.026	-0.008	0.038
	(0.028)	(0.042)	(0.027)	(0.040)	(0.028)	(0.042)
Log SPECIFIC						
cigarettes	0.001	0.000				
	(0.000)	(0.001)				
Ad valorem						
cigarettes	0.001	-0.001				
	(0.001)	(0.001)				
Log SPECIFIC FCT	-0.000	0.000				
	(0.000)	(0.000)				
Ad valorem FCT	-0.000	0.000				
	(0.001)	(0.001)				
Log harmonized						
index of consumer						
prices	0.284***	0.425***	0.278***	0.457***		
	(0.067)	(0.112)	(0.067)	(0.111)		
Linear trend	0.014***	0.019***	0.014***	0.017**	0.022***	0.033***
	(0.003)	(0.007)	(0.003)	(0.006)	(0.003)	(0.005)
Intercept	-1.977***	-2.826***	-2.101***	-3.405***	-0.974***	-1.485***
	(0.133)	(0.159)	(0.119)	(0.140)	(0.078)	(0.091)
Rho	0.661	0.757	0.663	0.763	0.645	0.756
R2	0.885	0.685	0.876	0.640	0.871	0.628
AIC	-1071.2	-828.9	-1072.8	-832.0	-1055.3	-815.0
N	250	240	250	240	250	240

\*\*\* p<.01, \*\* p<.05, \* p<.1

All the models suggest that the effect of tax rates on retail prices may be subsumed by the LED, as none of the other tax variables are significant in any of the specifications. All models also suggest that i) the effect of the LED of cigarettes on the price of cigarettes operates both contemporaneously and with one period lag and ii) the LED of cigarettes has a significant effect on the price of FCT. Models 4 and 6 suggest that the LED of FCT has a significant effect on the price of FCT. Models 1–4 also suggest a significant effect of inflation on the price of the corresponding product. Similarly, in all specifications the estimate for the first-order correlation

coefficient of the disturbances is positive, though in the absence<sup>9</sup> of a standard error for this parameter estimate it is not possible to test their significance.

The choice of model as the basis for simulations of the effect on prices of changes in tax rates is guided by the values of the Akaike information criterion (AIC), which suggest that the best specifications in terms of parsimony and explanatory power are model 3 for cigarettes and model 4 for FCT.

In model 3 for cigarettes, the own tax pass-through elasticity is 0.45, implying that a 10-percent increase in the LED on cigarettes is associated with a 4.5-percent increase in their weighted average price (approximately three quarters of this effect takes place contemporaneously and the rest with a lag of one year). Considering that the sample mean values of the price of cigarettes and the LED are €4.84 and €2.8 per 20 sticks, respectively, such tax elasticity suggests a 100-percent pass-through rate. For every one-percent increase in the consumer price index, the average price of cigarettes is expected to increase by 0.027 percent.

In model 4 for FCT, the own tax pass-through elasticity is 0.10, implying that a 10-percent increase in the LED on cigarettes is associated with a 1-percent increase in the weighted average price of FCT. At sample means of €2.60 and €1.5 per 20 sticks for the price and LED of FCT, respectively, this elasticity suggests a substantial degree of tax under-shifting. On the other hand, the tax pass-through elasticity of the price of FCT with respect to the LED on cigarettes is positive, 0.2, and significant, suggesting that the prices of FCT are in fact less responsive to changes in their own taxes than to changes in the taxation of cigarettes.

Models 3 and 4 are used to predict the average prices of cigarettes and FCT in both the baseline current TTD and Draft Revised TTD scenarios. These predictions are conditional on the country fixed effects and use the retransformation from logarithms to levels suggested by Wooldridge (Wooldridge, 2013).

### Demand and excise revenue effects

The effects of the tax reforms on the demand for cigarettes and FCT are analyzed by means of a flexible demand model able to capture both expenditure and own- and cross-price effects. The model assumes a two-stage budgeting approach whereby, first, expenditure on combustible tobacco products (cigarettes, FCT, cigarillos, cigars, and pipe tobacco) is determined as a function of total expenditure and the relative price of this product class, as well as country fixed

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<sup>9</sup>Estimates are obtained by means of the *xtregar* command of Stata™ version 17.0. This command does not compute the variance of the estimated correlation coefficient.

effects, a time trend and additional controls for the COVID-19 pandemic period. In a second stage, the expenditure on combustible products determined in the first stage is divided into three separate products—cigarettes, FCT and the rest of combustible tobacco—as a function of their relative prices, country fixed effects and a time trend. The functional form adopted for both stages is the almost ideal demand system of Deaton and Muellbauer (Deaton and Muellbauer, 1980), which is a popular choice in studies of differentiated products’ markets (Davis and Garcés, 2009).

To account for the endogeneity of prices in both stages, contemporaneous and lagged tax rates are used as instruments in an iterated least squares estimator (Blundell and Robin, 1999) implemented in the *aidsills* command of Stata™, developed by Lecocq and Robin (Lecocq and Robin, 2015). The estimation sample comprises 23 member states (the current bloc except Luxembourg, Malta, Cyprus, and Estonia) from 2012–2022.

### First stage results

Table A2 presents a summary of results for the first stage of the model estimates in the form of predicted expenditure shares and budget and own- (compensated-) price elasticities for combustible tobacco products. These statistics are computed at the estimation sample means values, and asterisks are used to denote the level of statistical significance.

**Table A2.** First stage predicted shares, budget and own-price elasticities

FIRST STAGE; PREDICTED SHARE, BUDGET AND OWN-PRICE ELASTICITIES			
	Shares	Budget Elast.	Price Elast.
Combustible Tobacco	0.023***	0.559***	-0.665***

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

As shown in the table, expenditure on combustible tobacco products represents on average 2.3 percent of total consumer expenditure. The budget elasticity of 0.55 is in accordance with the character of necessity goods of tobacco products (that is, normal goods whose demand changes less than proportionally with total expenditure). Likewise, the estimates for the own-price elasticity of combustible tobacco, -0.66, confirms their price-inelastic nature.

### Second stage results

Table A3 contains the corresponding summary for the second stage of the model. Cigarettes on average absorb 87.7 percent of expenditure in combustible products, while FCT represent 8.2

percent. The budget elasticities show that cigarettes are a normal good with an elasticity close to one, implying that the demand for cigarettes changes proportionally with expenditure on combustibles. FCT on the contrary has a smaller budget elasticity, implying less than proportional changes in its demand when expenditure on combustibles changes. The price elasticities show that the demand for cigarettes is less price-elastic than combustibles, but FCT on the other hand is very price-elastic.

**Table A3.** Second stage predicted shares, budget and *own-price* elasticities

SECOND STAGE; PREDICTED SHARES, BUDGET AND OWN-PRICE ELASTICITIES			
	Shares	Budget Elast.	Price Elast.
Cigarettes	0.877***	1.062***	-0.298***
FCT	0.082***	0.606***	-2.057***

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

Next, Table A4 shows the compensated cross-price elasticities for these two products, along with their elasticity with respect to the price of the rest of combustibles. Cigarettes and FCT are clearly substitute goods, but cigarettes are much less responsive to changes in the price of FCT than the other way around. Changes in the price of the rest of combustibles affect the demand for cigarettes, with a small but significant positive cross-price elasticity.

**Table A4.** Second stage compensated cross-price elasticities

SECOND STAGE: COMPENSATED CROSS-PRICE ELASTICITIES			
	Cigarettes	FCT	Rest of combustibles
Cigarettes	-0.298***	0.183***	0.115***
FCT	2.459***	-2.057***	-0.402

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

For both the baseline and the Commission’s proposed scenarios, the estimates for the first stage of the model are used to predict expenditure on combustible products. Conditional on such expenditures, the estimates for the second stage are used to predict the share of the former

spent on each of the subproducts. And given these new shares for the second stage of the model, the market volumes and excise revenues are retrieved for both scenarios.

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