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# Promoting convergence and closing gaps using affordability-based minimum taxes: an illustration using the European Union Tobacco Tax Directive

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## ABSTRACT

**Background** The rules governing tobacco taxation in the European Union (EU) are currently under revision. Earlier research has proposed reforms aimed at stimulating price convergence across countries by linking national minimum taxes to a measure of average prices across the EU. This paper proposes that revised tax rules include an affordability criterion whereby minimum taxes are required to be no less than a common prespecified fraction of domestic average disposable income.

**Methods** Longitudinal data on prices and taxes on factory-made cigarettes and roll-your-own tobacco in 24 EU member states and the UK between 2011 and 2019 are used to estimate econometric models for their weighted average prices as a function of taxes. Two scenarios are simulated with the models' estimates: a baseline scenario for the actual tax stance pertaining to 2020 and a reform scenario implementing an additional affordability criterion.

**Results** The affordability criterion would significantly increase the price of both tobacco products, particularly in richer countries with relatively low tobacco prices that are often not affected by the increases in nominal minima mandated by the EU rules. There would also be some price convergence between the two tobacco products, both on average and in the majority of countries.

**Conclusions** Such results show an affordability criterion could be a potentially fruitful complement to the tax reforms proposed in earlier research.

## INTRODUCTION

Council Directive 2011/64/EU from the European Union (EU), commonly known as the Tobacco Tax Directive (TTD), governs the taxation of tobacco products in EU countries, including establishing various minimum tax levels/criteria.<sup>1</sup> At the time of writing, reform of the TTD is being considered by the European Commission, as it has been found that there is a lack of price convergence between EU member states and there has been price/tax-induced substitution of factory-made cigarettes (FM) for roll-your-own tobacco (RYO). In a previous paper we outlined how additional minimum tax requirements within a revised TTD could reduce the gap between the prices of FM and RYO within countries (by equalising their minimum tax on a per stick basis), as well as promote their upward convergence across countries (by relating the minimum tax on FM to average FM prices across the EU).<sup>2</sup> However, while these provisions would ensure that the price gap between RYO and FM is reduced in

all countries, they would not lead to FM price rises in countries where taxes are already above the EU average. These turn out to be among the richest EU countries (Belgium, Denmark, Germany, Finland, France, Ireland, the Netherlands, and the UK). From the perspective of public health, a revised TTD that leads to cigarette price increases in all member states would be preferable, especially since, as the literature on tobacco affordability suggests, the degree of effort in terms of foregone income is an important determinant of tobacco consumption.<sup>3–5</sup> Our contention in this paper is that it would be possible to address this concern if reforms to the TTD included a further criterion linking minimum taxes to a measure of tobacco affordability. The intention of such a measure would be twofold: (1) to ensure tobacco taxation keeps pace with national income growth; and (2) to make sure taxation in relatively wealthy countries is high enough relative to average consumer income levels to deter tobacco use. This paper illustrates the effects on retail prices of implementing a tax reform based on such an affordability criterion in the context of the revision process of the EU TTD.

## METHOD

### Modelling the effect of taxes on prices

To predict the effect of taxes on prices without imposing ex-ante assumptions on tax pass-through, we use estimates from econometric models of the weighted average price (WAP) of both FM and RYO for 24 EU countries and the UK as used in earlier research (including using the same core data).<sup>2</sup> In these models, the effect of tax policies on prices is subsumed by a measure of the minimum tax on the corresponding product applied in each country over time. Along with country fixed effects, this measure of minimum tax explains a large proportion (R-squared statistics more than 95%) of the variation in the WAP of the two products. The estimates show that for every €1 increase in the minimum tax applied on 20 cigarettes, their WAP is expected to rise by €1 which implies that increases in minimum tax rates are typically passed on entirely to retail prices. In the case of RYO, for every €1 increase in the minimum tax applied on the amount of RYO necessary to roll 20 sticks (14 g at 0.7 g per stick<sup>6</sup>), their WAP is expected to increase by €0.86. This implies that increases of the minimum taxes on RYO are typically undershifted to retail prices.

To explore the impact of changed minimum taxes within a revised TTD, we simulate and then compare two scenarios. The baseline scenario



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corresponds to the tax stance actually prevailing in 2020. In the reform scenario, we model the effects of the proposed tax reforms, where changes in tax levels are fed to the model via the explanatory variable, and predictions for prices are conditional on the new tax levels and country fixed effects.

### Definition of the tax reform based on affordability criteria

Since the purpose of the paper is to illustrate the functioning of a tax reform based purely on affordability criteria, we abstain from considering the price convergence mechanisms illustrated in our previous research.<sup>2</sup> Likewise, we simplify the tax equalisation mechanism between FM and RYO by using the same minimum tax on 1000 cigarettes/1000 g RYO in the reform scenario.

To choose a reform that illustrates the main idea behind this paper, we first examine the ratio of the minimum tax borne by 1000 cigarettes over Disposable Household Income per capita in Purchasing Parity Standards (GDI) across EU countries from Eurostat, using the latest year for which this statistic is available (2017).<sup>7</sup> We use this measure of household income rather than other popular measures such as Gross Domestic Product (GDP) because, according to Eurostat "...this indicator reflects the purchasing power of households and their ability to invest in goods and services or save for the future, by accounting for taxes and social contributions and monetary in-kind social benefits".<sup>8</sup> On average, the ratio across the EU is 0.85%, ranging between 2% in Ireland and 0.36% in Luxembourg, which is the richest country in terms of GDI. In the poorest country, Bulgaria, the ratio, at 0.83%, is close to the EU average.

For this illustration we choose a reform whereby member states must set minimum tax rates on 1000 cigarettes/1000 g RYO to account for no less of 0.83% of their GDI. This is an arbitrary criterion, and by no means does it imply that the affordability of cigarettes in Bulgaria is at the optimal level from the perspective of public health. However, opting for requiring the taxes on 1000 cigarettes/1000 g RYO to match at least the effort in terms of disposable income made in the poorest EU country when purchasing the same amounts of tobacco products would have the merit of triggering tax rises in high-income countries generally regarded as having a lax fiscal stance on tobacco (eg, Luxembourg). Also, it is worth noting that Bulgaria has the largest ratio of tax burden to nominal (rather than Purchasing Power Parity - PPP - adjusted) household disposable income, a gauge of affordability more in consonance with the standard practice in the literature, which further supports its role as an illustrative benchmark for the purposes of this paper.

### RESULTS

Applying the reform scenario to FM results in considerable increases in both minimum tax rates and hence predicted prices in a majority of countries relative to the baseline (table 1). The central estimates show a mean increase is €0.43 for a packet of 20 (€5.27 changing to €5.70), while Germany experiences the largest increase of €1.56 (€5.90 to €7.45), both Austria and Sweden experience increases of more than €1, while eight countries face no change.

For RYO, the mean increase is larger at €0.54 per 20 stick equivalents with Germany experiencing the biggest increase of €2.03 (€2.00 to €4.03), Austria and Belgium both experiencing an increase of more than €1, while only five countries face no change.

The price gap between the price of FM and RYO would decline by a mean of €0.11 (suggesting some degree of convergence), with the biggest reduction being €0.89 in Belgium (€4.27

to €3.38), the Netherlands and Estonia both seeing reduction greater than €0.50, and with 15 countries seeing such a decrease. In seven countries, there would be an increase in the gap, most of which are relatively small. In some of these cases, the cause is that FM prices rise while RYO prices remain unaltered because taxes on RYO in the baseline reached the threshold set for this product in the reform scenario (Greece and Portugal). In most of the rest of countries, despite minimum taxes on RYO increasing more in the reform scenario than the corresponding increases for FM, the cause for the increase in the price gap is the undershifting of taxes to RYO retail prices embodied in the econometric model estimates (Austria, Czech Republic, Italy and Slovenia). For Sweden, where the gap increases by the largest absolute amount, €0.84, the undershifting in RYO retail prices is compounded by the increase in minimum taxes on FM in the reform scenario being larger than the corresponding increase for RYO.

### DISCUSSION AND CONCLUSION

Setting minimum tobacco tax rates to match a given percentage of average household income is a potentially fruitful complement to the mechanisms proposed in earlier research for changes that the revision of the TTD should include from the point of view of tobacco control. As this paper shows, such a mechanism would extend the need to raise taxes to member states where tobacco products are relatively affordable despite applying taxes that are above the EU average. The focus on the pure effect of using the affordability criterion also show its limitations if used in isolation, namely a weak impact on price convergence. Therefore, affordability schemes should be implemented in combination with mechanisms that have a stronger impact on convergence, like linking minimum taxes to a measure of average prices across the EU. This paper also shows that since taxes on RYO are typically undershifted to retail prices, the full elimination of price gaps between FM and RYO requires minimum taxes on the latter to rise faster than on the former.

The disposable household income measure of spending power used in this paper is not the only potentially valid indicator, especially considering that other income measures, such as GDP, have been used in the affordability literature before. However, disposable household income, unlike GDP, takes into account taxes and transfers to/from households and may therefore be argued to provide a more accurate approximation to the consumption possibilities of the average household. Nevertheless, it should be recognised that neither is perfect, especially since they do not consider the extent to which income is equally distributed within each member state. Furthermore, the Bulgarian affordability ratio, despite being close to the average ratio across the EU, is an arbitrary choice used solely for the purposes of illustration and therefore must not be given any normative interpretation. Adoption of a greater affordability threshold would imply a larger number of countries having to raise taxes and vice versa.

Finally, it is important to note that reaching a given affordability benchmark cannot be interpreted as having achieved the optimal level of tobacco taxation from the point of view of public health. On the contrary, the merits of affordability schemes such as the one explored herein are that they would lead to minimum tobacco taxes increasing as mean consumer income increases, thereby ensuring tobacco does not become more affordable in general terms over time. Though this is desirable even in situations where the general level of taxes is not sufficiently high to discourage tobacco consumption, affordability benchmarks

**Table 1** Minimum tobacco taxes and associated prices for FM cigarettes and RYO tobacco in the baseline and affordability reform scenarios in 2020 (€)

| Country | FM (95% CI)      |                         |                |                         | RYO (95% CI)             |                         |                |                        | FM to RYO price gaps (95% CI) |                          |                          |                           |
|---------|------------------|-------------------------|----------------|-------------------------|--------------------------|-------------------------|----------------|------------------------|-------------------------------|--------------------------|--------------------------|---------------------------|
|         | Min tax baseline | WAP baseline            | Min tax reform | WAP reform              | Increase in WAP          | WAP baseline            | Min tax reform | WAP reform             | Increase in WAP               | Baseline                 | Reform                   | Change                    |
| AT      | 151.8            | 4.97<br>(4.90 to 5.04)  | 223.9          | 6.48<br>(6.20 to 6.75)  | 1.51<br>(1.32 to 1.69)   | 2.75<br>(2.51 to 2.97)  | 223.9          | 4.01<br>(3.69 to 4.32) | 1.26<br>(1.09 to 1.43)        | 2.23<br>(2.01 to 2.45)   | 2.47<br>(2.14 to 2.79)   | 0.25<br>(0.038 to 0.455)  |
| BE      | 191.6            | 6.28<br>(6.17 to 6.37)  | 210.9          | 6.68<br>(6.46 to 6.89)  | 0.4<br>(0.353 to 0.452)  | 2.01<br>(1.76 to 2.25)  | 210.9          | 3.3<br>(2.97 to 3.62)  | 1.29<br>(1.11 to 1.47)        | 4.27<br>(4.06 to 4.50)   | 3.38<br>(3.08 to 3.69)   | -0.89<br>(-1.0 to -0.72)  |
| BG      | 90.5             | 2.65<br>(2.64 to 2.65)  | 90.5           | 2.68<br>(2.48 to 2.87)  | 0<br>(0 to 0)            | 1.64<br>(1.61 to 1.66)  | 90.5           | 1.65<br>(1.48 to 1.80) | 0.16<br>(0.134 to 0.177)      | 1.01<br>(0.696 to 1.30)  | 1.04<br>(0.821 to 1.21)  | -0.16<br>(-0.17 to -0.13) |
| CZ      | 112.7            | 3.53<br>(3.48 to 3.57)  | 153.7          | 4.39<br>(4.16 to 4.61)  | 0.86<br>(0.753 to 0.965) | 2.03<br>(1.90 to 2.15)  | 153.7          | 2.73<br>(2.51 to 2.95) | 0.7<br>(0.610 to 0.804)       | 1.5<br>(1.29 to 1.71)    | 1.66<br>(1.40 to 1.89)   | 0.15<br>(0.034 to 0.270)  |
| DE      | 163.6            | 5.89<br>(5.82 to 5.96)  | 238.1          | 7.45<br>(7.17 to 7.73)  | 1.56<br>(1.36 to 1.75)   | 2<br>(1.95 to 2.04)     | 238.1          | 4.03<br>(3.66 to 4.39) | 2.03<br>(1.75 to 2.31)        | 3.89<br>(3.70 to 4.08)   | 3.42<br>(3.02 to 3.80)   | -0.47<br>(-0.74 to -0.18) |
| DK      | 235.1            | 7.1<br>(6.79 to 7.41)   | 235.1          | 7.11<br>(6.85 to 7.36)  | 0<br>(0 to 0)            | 3.63<br>(3.19 to 4.06)  | 202.1          | 3.89<br>(3.64 to 4.13) | 0.26<br>(0.222 to 0.293)      | 3.47<br>(3.16 to 3.74)   | 3.22<br>(2.95 to 3.47)   | -0.26<br>(-0.29 to -0.22) |
| EE      | 138.6            | 4.07<br>(3.91 to 4.21)  | 138.6          | 4.07<br>(3.85 to 4.27)  | 0<br>(0 to 0)            | 0.91<br>(0.789 to 1.02) | 131.5          | 1.42<br>(1.21 to 1.61) | 0.51<br>(0.440 to 0.579)      | 3.16<br>(2.93 to 3.38)   | 2.65<br>(2.40 to 2.91)   | -0.51<br>(-0.57 to -0.44) |
| EL      | 117.5            | 3.79<br>(3.76 to 3.81)  | 123.8          | 3.92<br>(3.72 to 4.12)  | 0.13<br>(0.116 to 0.149) | 3.53<br>(3.41 to 3.65)  | 170.0          | 3.53<br>(3.36 to 3.70) | 0<br>(0 to 0)                 | 0.26<br>(0.064 to 0.463) | 0.39<br>(0.185 to 0.592) | 0.13<br>(0.116 to 0.149)  |
| ES      | 131.5            | 4.46<br>(4.45 to 4.46)  | 163.3          | 5.13<br>(4.91 to 5.33)  | 0.66<br>(0.584 to 0.748) | 2.37<br>(2.33 to 2.40)  | 163.3          | 3.15<br>(2.93 to 3.35) | 0.78<br>(0.678 to 0.894)      | 2.09<br>(1.88 to 2.27)   | 1.98<br>(1.74 to 2.21)   | -0.12<br>(-0.22 to -0.00) |
| FI      | 292.3            | 7.88<br>(7.47 to 8.28)  | 292.3          | 7.89<br>(7.59 to 8.18)  | 0<br>(0 to 0)            | 3.03<br>(2.61 to 3.43)  | 201.7          | 3.29<br>(3.04 to 3.52) | 0.26<br>(0.223 to 0.294)      | 4.85<br>(4.51 to 5.18)   | 4.6<br>(4.29 to 4.93)    | -0.26<br>(-0.29 to -0.22) |
| FR      | 314.0            | 9.08<br>(8.69 to 9.45)  | 314.0          | 9.09<br>(8.80 to 9.37)  | 0<br>(0 to 0)            | 5.41<br>(4.63 to 6.17)  | 281.0          | 5.41<br>(5.10 to 5.71) | 0<br>(0 to 0)                 | 3.67<br>(3.33 to 4.01)   | 3.68<br>(3.33 to 4.05)   | 0<br>(0 to 0)             |
| HR      | 111.2            | 3.62<br>(3.55 to 3.68)  | 114.1          | 3.62<br>(3.37 to 3.85)  | 0.06<br>(0.053 to 0.069) | 2.26<br>(2.09 to 2.42)  | 114.1          | 2.33<br>(2.10 to 2.54) | 0.07<br>(0.064 to 0.085)      | 1.36<br>(1.03 to 1.65)   | 1.29<br>(1.00 to 1.57)   | -0.01<br>(-0.02 to -0.00) |
| HU      | 103.0            | 3.69<br>(3.64 to 3.72)  | 118.0          | 4<br>(3.80 to 4.20)     | 0.31<br>(0.275 to 0.352) | 1.43<br>(1.36 to 1.50)  | 118.0          | 2.12<br>(1.90 to 2.32) | 0.68<br>(0.590 to 0.778)      | 2.26<br>(2.06 to 2.45)   | 1.89<br>(1.65 to 2.11)   | -0.37<br>(-0.45 to -0.28) |
| IE      | 395.0            | 11.88<br>(11.4 to 12.2) | 395.0          | 11.89<br>(11.5 to 12.1) | 0<br>(0 to 0)            | 8.03<br>(7.43 to 8.62)  | 379.8          | 8.03<br>(7.77 to 8.29) | 0<br>(0 to 0)                 | 3.85<br>(3.49 to 4.20)   | 3.85<br>(3.51 to 4.20)   | 0<br>(0 to 0)             |
| IT      | 141.3            | 4.81<br>(4.80 to 4.82)  | 182.3          | 5.67<br>(5.45 to 5.88)  | 0.86<br>(0.753 to 0.965) | 2.6<br>(2.50 to 2.70)   | 182.3          | 3.24<br>(3.03 to 3.45) | 0.63<br>(0.550 to 0.724)      | 2.21<br>(2.01 to 2.41)   | 2.43<br>(2.18 to 2.71)   | 0.22<br>(0.104 to 0.336)  |
| LT      | 108.5            | 3.41<br>(3.31 to 3.51)  | 147.4          | 4.23<br>(3.98 to 4.47)  | 0.81<br>(0.714 to 0.915) | 1.61<br>(1.47 to 1.74)  | 147.4          | 2.45<br>(2.20 to 2.68) | 0.84<br>(0.724 to 0.954)      | 1.8<br>(1.59 to 2.00)    | 1.78<br>(1.50 to 2.03)   | -0.02<br>(-0.14 to 0.104) |
| LV      | 114.7            | 3.58<br>(3.49 to 3.66)  | 119.5          | 3.68<br>(3.48 to 3.88)  | 0.1<br>(0.088 to 0.112)  | 2.32<br>(2.22 to 2.40)  | 119.5          | 2.86<br>(2.65 to 3.05) | 0.54<br>(0.467 to 0.616)      | 1.26<br>(1.05 to 1.46)   | 0.83<br>(0.618 to 1.06)  | -0.44<br>(-0.51 to -0.37) |
| NL      | 238.3            | 7.12<br>(6.90 to 7.32)  | 238.3          | 7.12<br>(6.89 to 7.34)  | 0<br>(0 to 0)            | 3.4<br>(3.01 to 3.77)   | 207.0          | 4.02<br>(3.74 to 4.29) | 0.62<br>(0.536 to 0.707)      | 3.72<br>(3.47 to 4.01)   | 3.1<br>(2.86 to 3.36)    | -0.62<br>(-0.70 to -0.53) |
| PL      | 103.9            | 3.24<br>(3.20 to 3.28)  | 130.8          | 3.81<br>(3.59 to 4.01)  | 0.56<br>(0.493 to 0.632) | 1.43<br>(1.42 to 1.44)  | 130.8          | 2.43<br>(2.19 to 2.65) | 0.99<br>(0.859 to 1.13)       | 1.81<br>(1.58 to 2.00)   | 1.38<br>(1.13 to 1.64)   | -0.43<br>(-0.55 to -0.29) |
| PT      | 136.8            | 4.43<br>(4.42 to 4.43)  | 148.1          | 4.67<br>(4.47 to 4.86)  | 0.24<br>(0.209 to 0.267) | 3.68<br>(3.36 to 3.99)  | 175.0          | 3.68<br>(3.49 to 3.87) | 0<br>(0 to 0)                 | 0.75<br>(0.529 to 0.964) | 0.98<br>(0.734 to 1.19)  | 0.24<br>(0.209 to 0.267)  |
| RO      | 109.0            | 3.73<br>(3.70 to 3.75)  | 119.1          | 3.83<br>(3.63 to 4.03)  | 0.21<br>(0.185 to 0.237) | 3.15<br>(3.13 to 3.16)  | 119.1          | 3.67<br>(3.50 to 3.84) | 0.25<br>(0.220 to 0.290)      | 0.58<br>(0.274 to 0.891) | 0.16<br>(-0.07 to 0.380) | -0.04<br>(-0.07 to -0.00) |

Continued

**Table 1** Continued

|   | FM (95% CI)             |                         | RYO (95% CI)            |                        | FM to RYO price gaps (95% CI) |                         |                        |                         |                        |                          |                          |                          |                          |                |
|---|-------------------------|-------------------------|-------------------------|------------------------|-------------------------------|-------------------------|------------------------|-------------------------|------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------------|
| SE  | 149.6<br>(5.50 to 5.66) | 5.59<br>(3.62 to 3.71)  | 201.5<br>(4.19 to 4.62) | 6.67<br>(3.78 to 3.98) | 1.09<br>(0.648 to 0.831)      | 181.1<br>(4.67 to 4.97) | 4.83<br>(2.32 to 2.58) | 201.5<br>(2.90 to 3.34) | 5.07<br>(2.90 to 3.34) | 0.25<br>(0.581 to 0.766) | 0.76<br>(1.00 to 1.41)   | 1.6<br>(1.03 to 1.55)    | 0.84<br>(-0.03 to 0.174) |                |
| SI  | 114.0<br>(3.23 to 3.25) | 3.67<br>(3.23 to 3.25)  | 149.3<br>(3.23 to 3.25) | 4.41<br>(3.57 to 3.98) | 0.74<br>(0.467 to 0.598)      | 94.0<br>(2.53 to 2.53)  | 2.46<br>(2.53 to 2.53) | 149.3<br>(2.94 to 3.31) | 3.13<br>(2.94 to 3.31) | 0.67<br>(0.513 to 0.676) | 1.21<br>(0.522 to 0.938) | 1.28<br>(0.417 to 0.878) | 0.07<br>(-0.14 to 0.026) |                |
| SK  | 100.1<br>(10.0 to 10.3) | 3.25<br>(10.0 to 10.3)  | 125.5<br>(10.0 to 10.3) | 3.78<br>(9.98 to 10.4) | 0.53<br>(0 to 0)              | 76.7<br>(6.35 to 6.57)  | 2.54<br>(6.35 to 6.57) | 125.5<br>(6.29 to 6.63) | 3.13<br>(6.29 to 6.63) | 0.59<br>(0 to 0)         | 0.71<br>(3.48 to 3.95)   | 0.65<br>(3.50 to 3.96)   | -0.06<br>(0 to 0)        |                |
| UK  | 330.4<br>(5.18 to 5.36) | 10.19<br>(5.18 to 5.36) | 330.4<br>(5.18 to 5.36) | 10.2<br>(5.57 to 5.83) | 0<br>(0.37 to 0.47)           | 248.6<br>(2.95 to 3.08) | 6.47<br>(2.95 to 3.08) | 248.6<br>(2.95 to 3.08) | 6.47<br>(3.44 to 3.69) | 0<br>(0.46 to 0.61)      | 3.73<br>(2.15 to 2.34)   | 3.73<br>(1.99 to 2.29)   | 0<br>(-1.82 to -0.03)    |                |
| Mean  | 167.8                   | 5.28                    | 188.1                   | 5.7                    | 0.43                          | 135.3                   | 3.02                   | 179.4                   | 3.56                   | 0.54                     | 2.26                     | 2.14                     | -0.11                    |                |
| SD  | 89.2                    | 2.39                    | 78.7                    | 2.31                   | 0.48                          | 81.1                    | 1.66                   | 63.8                    | 1.46                   | 0.49                     | 1.35                     | 1.22                     | 0.35                     |                |
| CV  | 0.5                     | 0.45                    | 0.4                     | 0.41                   | 1.12                          | 0.6                     | 0.55                   | 0.4                     | 0.41                   | 0.92                     | 0.6                      | 0.57                     | -3.19                    |                |
| Median  | 131.5                   | 4.43                    | 153.7                   | 4.67                   | 0.24                          | 107.9                   | 2.54                   | 170.0                   | 3.29                   | 0.54                     | 2.09                     | 1.89                     | -0.04                    |                |
| IQR   | 2.66                    | (2.43 to 2.89)          | 3.18                    | (2.90 to 3.32)         | 0.74                          | (0.64 to 0.83)          | 1.52                   | (1.36 to 1.66)          | 1.28                   | (1.06 to 1.41)           | 2.46                     | (1.75 to 2.23)           | 0.44                     | (0.37 to 0.48) |
| IQR to median   | 0.6                     | (0.55 to 0.66)          | 0.68                    | (0.61 to 0.71)         | 3.10                          | (3.10 to 3.10)          | 0.6                    | (0.52 to 0.65)          | 0.39                   | (0.32 to 0.42)           | 1.17                     | (1.02 to 1.32)           | 1.03                     | (0.93 to 1.21) |
| Minimum excise tax of FM cigarettes is expressed in € per 1000 FM cigarettes.<br>Minimum excise tax of RYO tobacco is expressed in € per 1000 g of fine-cut tobacco.<br>WAP of FM cigarettes is expressed in € per 20 FM cigarettes.<br>WAP of RYO tobacco is expressed in € per 20 sticks equivalent of fine-cut tobacco (ie, 14g).<br>AT (Austria), BE (Belgium), BG (Bulgaria), CZ (Czech Republic), DE (Germany), DK (Denmark), EE (Estonia), EL (Greece), ES (Spain), FI (Finland), FR (France), HR (Croatia), HU (Hungary), IE (Ireland), IT (Italy), LT (Lithuania), LV (Latvia), NL (Netherlands), PL (Poland), PT (Portugal), RO (Romania), SE (Sweden), SI (Slovenia), SK (Slovakia), UK (United Kingdom)<br>AT, Austria; BE, Belgium; BG, Bulgaria; CV, coefficient of variation; CZ, Czech Republic; DE, Germany; DK, Denmark; EE, Estonia; EL, Greece; ES, Spain; FI, Finland; FM, factory made; FR, France; HR, Croatia; HU, Hungary; IE, Ireland; IT, Italy; LT, Lithuania; LV, Latvia; NL, Netherlands; PL, Poland; PT, Portugal; RO, Romania; RYO, roll-your-own; SE, Sweden; SI, Slovenia; SK, Slovakia; UK, United Kingdom; WAP, weighted average price. |                         |                         |                         |                        |                               |                         |                        |                         |                        |                          |                          |                          |                          |                |

should be complemented with other mechanisms that ensure that taxes effectively reduce smoking prevalence. An especially important caveat when considering tax adjustments based on affordability is that, though national incomes tend to rise over time, they can also fall (as we have seen during COVID-19-related lockdowns/restrictions). A blind application of affordability benchmarks could then result in lower levels of minimum tobacco taxation, so the revised TTD tax rules should include a no regression provision that prevents minimum tax rates from falling in such situations.

### What this paper adds

- ⇒ Considerable price gaps between both factory-made cigarettes and fine-cut tobacco, and between different countries are known to exist in many regions/countries, including in the European Union (EU).
- ⇒ Schemes such as the European Union Tobacco Tax Directive currently look to increase regional tobacco taxation and reduce differentials by increasing nominal minimum tax rates, although additional theoretical minimum tax rules have been proposed.
- ⇒ This paper proposes that minimum tax rules include a new affordability criterion so that richer countries with relatively low tobacco prices, which are often not affected by increase in nominal minima, are required to increase their taxation.
- ⇒ The paper simulates the effect of such a reform in EU tobacco taxation and shows that it would significantly increase tobacco prices. There would be some price convergence between the prices of the different products, both on average and in the majority of countries.

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**Data availability statement** Data on the prices of factory-made (FM) cigarettes, and on tax rates for FM cigarettes and roll-your-own (RYO) tobacco are publicly accessible at the CIRCABC database (<https://circabc.europa.eu/ui/welcome>). Data on RYO prices may be obtained from the Euromonitor Passport Database (<https://go.euromonitor.com/passport.html>). Data on Adjusted gross disposable income of households per capita in Purchasing power standard are available from Eurostat (<https://ec.europa.eu/eurostat/databrowser/view/TEC00113/default/table>).

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