Affordability of cigarettes in ten Southeastern European countries between 2008 and 2019

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ABSTRACT

Background The empirical evidence shows that tobacco consumption is strongly associated with its affordability. The nominal growth in tobacco prices imposed by taxation should exceed or at least keep pace with nominal income growth, ensuring that tobacco products become less affordable over time. No analysis covering affordability issues in the Southeastern European (SEE) region has been conducted prior to this research.

Objectives The study aims to examine trends in cigarette affordability in ten selected SEE countries over the period 2008–2019 and the impact of affordability on the consumption of cigarettes. On the policy side, it aims to support conducting of more effective evidence-based policy of tobacco taxation.

Methods The relative income price of cigarettes and the tobacco affordability index are used as affordability measures. The panel regression was run to estimate the impact of affordability measures and other covariates on cigarette consumption.

Results The affordability of cigarettes in the selected SEE countries has decreased on average but showed different patterns over the observed period. A decline in affordability has been more dynamic in Western Balkan (non-EU members) countries and low-and-middle-income countries within the SEE region. Econometric estimation confirms affordability as the main determinant of tobacco consumption, indicating that a decline in affordability considerably reduces tobacco consumption.

Conclusions Despite the evidence, affordability is still widely ignored by SEE policymakers when designing national tobacco taxation policies. Policymakers should be aware of the risk that future increases in cigarette prices could lag behind real income growth, making tax policy less effective at reducing consumption. Reducing affordability should be the paramount consideration in designing effective tobacco taxation policies.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Rather than the cigarettes' price alone, affordability appears as a key determinant of the demand for cigarettes since the increase in tobacco prices due to heavier taxation can be easily offset by the increase in income.

⇒ Existing empirical literature shows that cigarette affordability in high-income countries has decreased between 1990 and 2018, while over the same period cigarettes have become more affordable in low-and-middle-income countries (LMICs).

⇒ Absent from this evidence is any analysis of cigarette affordability in the Southeastern European (SEE) region.

WHAT THIS STUDY ADDS

⇒ We provide the first comparison of the affordability trends and the impact of affordability on the consumption of cigarettes in the SEE region.

⇒ The affordability trends in SEE countries over the last decade have been related to the EU membership status and degree of harmonisation with EU tobacco directives.

⇒ The affordability in LMICs in the SEE region (seven out of ten countries) has declined at a higher pace than in the other LMICs.

⇒ The estimated impact of affordability on the consumption of cigarettes appears higher than in similar empirical work.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our study provides valuable insights for future tobacco control policy measures in SEE countries by assessing the benefits of including affordability as an additional criterion when developing effective excise policies.

⇒ Our findings point to shortcomings of the tobacco taxation policies that rely exclusively on the inflation trends without considering changes in income.

⇒ Tax directives and tobacco excise calendars that require the use of tobacco affordability indicators in designing tobacco taxation policy could be an efficient way to reduce the high prevalence rate in the SEE region.

INTRODUCTION

The notion of cigarette affordability refers to the relation of cigarette prices and household incomes, as an indication of the household budget share spent on cigarettes. Affordability is a very important tobacco control metric and a useful input for tax policymakers since it provides insight into whether increasing cigarette prices sufficiently reduces consumption. Due to its impact on price, taxation is considered an effective tool for reducing cigarette demand.[1–3] However, taxation's effects largely depend on income changes, as increasing incomes can easily offset the price effects.[4] Consequently, an increase in taxes adjusted only by inflation rates but not by changes in income will not be sufficient to discourage tobacco consumption.[5] Rather than the price of cigarettes alone, cigarette affordability appears as a key determinant of the demand for

cigarettes since the increase in income may erode the effects of taxes or prices by making cigarettes more affordable.[6]

The affordability of cigarettes is a research topic in a limited number of published studies.[7] Most of them investigate the affordability of cigarettes for a selected region,[8 9] or for individual countries.[3 10–13] Estimates for several countries selected in the sample using specific criteria are rare.[14] The existing research on the estimation of the effects of cigarette affordability focuses on the relationship between tobacco consumption, tobacco taxation and affordability. The empirical studies identified mixed trends in cigarette affordability over time. In most developing countries in the Southeastern European (SEE) region that belong to low-and-middle-income countries (LMICs), cigarettes became less affordable during the period between 2008 and 2018.[14] Compared with EU member states, cigarettes were more affordable in the old EU members than in the new (since 2004).[9] However, results showed that cigarettes became less affordable over time in all of them. Cigarettes are perpetually more affordable in Eastern Mediterranean countries compared with similar ones.[3]

There are several methods that can be applied to analyse tobacco affordability and provide time and cross-country comparisons, depending on the available data. The most popular one is relative income price (RIP),[8] which calculates affordability as a percentage share of GDP per capita required to purchase 100 packs of cigarettes (2000 cigarette sticks). According to the second approach, affordability is measured by the tobacco affordability index (TAI), calculated as the real annual change in GDP divided by the change in tobacco prices adjusted for the overall inflation rate.[15]

It is important to mention that analysis of relation between affordability and cigarette consumption (regardless of the affordability measure applied) is useful to explore how simultaneous changes in price and income are associated with the change in consumption over time. Subsequently, affordability analysis complements studies of the standard demand function where the effects of prices and income on consumption are separately treated. Several studies that rigorously examine price and incomes elasticities in SEE countries (at the country-specific level) have been produced using the traditional demand function approach and large data sets of microdata from Household Budget Surveys (HBSs), with estimated price elasticity varying from −0.57 in Albania[16] to −1.37 in Bosnia and Herzegovina (BiH).[17] The concept of affordability has been incorporated into the most important policy reports covering global tobacco control issues. The Guidelines for Implementation of Article 6 of the WHO Framework Convention on Tobacco Control[18] suggest that national taxation policies should consider both income and price elasticity of demand for tobacco products to make them less affordable. Thus, periodic re-evaluation of tax levels is deemed necessary. The World Bank recommends occasional sharp increases in specific excises that would dramatically impact smokers' behaviour. In the meantime, excise increases should exceed—or at least keep pace with—changes in affordability, ensuring that tobacco products become less affordable over time.[19]

Affordability changes are particularly relevant for LMICs, which have recorded average growth rates higher than developed countries over the last two decades.[5] In cases where rapid economic growth is achieved and living standards improve, certain products in these countries become increasingly affordable. It is a desirable outcome for most products—but not for tobacco, alcohol and similar harmful products because their consumption generates substantial negative externalities.[20]

Moreover, LMICs are characterised by under-developed non-price tobacco control mechanisms, which implementation is usually undermined by relatively weak institutions. Indeed, existing empirical studies indicate an increasing trend in tobacco affordability in LMICs over the recent decades,[6 21 22] especially over the period 2000–2010.[5]

This research aims to analyse trends in cigarette affordability in ten selected SEE countries (five EU members: Bulgaria, Croatia, Hungary, Romania and Slovenia, and five Western Balkan (WB) countries aspiring to be EU members: Albania, BiH, Montenegro, North Macedonia and Serbia) and assess whether these changes are associated with changes in consumption. The countries were selected for the following reasons. First, SEE countries, especially WB countries, have excessive tobacco prevalence rates, which are considerably higher than those in the EU.[23] Therefore, insight into the affordability trends and their impact on consumption is particularly beneficial for policymakers in designing more appropriate tobacco control policies to reduce prevalence. Second, seven of the ten selected countries are middle-income countries, so the study's results will contribute to expanding knowledge on affordability trends in LMICs. Third, all selected countries are either in the process of harmonisation or have recently harmonised excise policies with EU directives. It allows assessing to what extent adopting more strict tobacco control regulations reduces the affordability and tobacco consumption. Eventually, since no similar research has been conducted in the SEE region, the results will provide valuable insights for future tobacco control policy measures by assessing the benefits of including affordability as an additional criterion when developing effective excise policies.

DATA AND METHODS

This tobacco affordability analysis was applied to ten selected SEE countries, using annual data for the period 2008–2019. Five of them are WB countries—Albania, BiH, Montenegro, North Macedonia and Serbia—which are not yet members of the EU and are all at different phases of EU accession. The rest of the analysed countries are EU members that entered the EU at different time points over the last 17 years: Hungary and Slovenia in 2004, Romania and Bulgaria in 2007, and Croatia in 2013. Regarding the latest World Bank income classification of the countries,[24] seven analysed countries are classified as upper-middle income (Albania, BiH, Montenegro, North Macedonia, Serbia, Bulgaria and Romania). In contrast, the other three (Slovenia, Hungary and Croatia) belong to high-income countries (requiring a gross national income per capita of at least US$12 695 in 2020 using the World Bank Atlas method). The covered period varies with respect to the scope of analysis due to the uneven availability of data across countries and variables. The overview of the key information concerning tobacco economics is presented in table 1.

To perform affordability analysis, the following data and sources were used:

► Consumption—for the EU countries, consumption per capita was calculated according to European Commission data on the annual consumption of cigarettes divided by the population (EUROSTAT); for the non-EU countries, per-capita consumption was calculated using national HBS data.
► RIP—per cent share of GDP per capita required to purchase 100 packs of 20 cigarettes of the most-sold brand, retrieved from WHO Global Health Observatory (GHO) data.
► Real prices—retail prices for a pack of 20 cigarettes expressed in local currency, retrieved from WHO GHO data

Table 1 Key information on tobacco economics in selected SEE countries

	GDP per capita (current US), 2021*	Prevalence of current tobacco use (% of adults)*	Government annual revenue from tobacco (total excise—specific and ad valorem), in EUR†	Most-sold brand of cigarettes (price in US), 2020†
ALB	6493	22.4	162 988 800	2.37
BiH	7143	35.0	443 378 472	3.60
BUL	12 221	39.0	1 398 073 162	3.03
CRO	17 685	36.9	689 465 604	3.92
HUN	18 728	31.8	n/a	5.11
MKD	6695	48.4‡	191 232 835	1.80
MNE	9466	31.4	46 390 000	2.73
ROM	14 858	28.0	2 695 183 799	5.03
SLO	29 291	22.0	416 480 000	4.50
SRB	9230	39.8	925 779 682	2.83

Government annual revenue from tobacco was calculated based on official 2009 WHO data (in national currencies) and average exchange rate for the following year.
*World Bank Database.
†WHO Country Reports.
‡Survey on Tobacco Products Consumption in Southeastern Europe (STC-SEE, 2019). Available at: http://dcs.ien.bg.ac.rs/61/

and converted to the international 2017 US$ using the IMF World Economic Outlook database.

▶ Price indices—consumer price index (CPI) of tobacco and Harmonized Index of Consumer Prices are retrieved from the national statistics and EUROSTAT database.

▶ GDP—annual GDP per capita growth retrieved from the IMF's World Economic Outlook data.

▶ Unemployment—share of unemployed people in total labour force retrieved from the World Bank's World Development Indicators database.

▶ MPOWER scores are retrieved from WHO reports and data sets. They refer to six tobacco control policy dimensions: M—monitor tobacco use, P—protect people from smoke, O—offer help to quit, W—warn about the dangers of tobacco, E—enforce bans on tobacco marketing and R—raise taxes on tobacco. The 'M' policy dimension score value ranges from 1 to 4, whereas other components range from 1 to 5 (1 refers to missing data, 2 is the weakest and 5 is the strongest policy). Since WHO collects MPOWER data on a biennial basis, missing values are linearly interpolated, so they may contain measurement errors.

To assess affordability trends and the relationship between changes in affordability and consumption of tobacco products, we applied a methodological framework that consists of two building blocks:

(a) Measuring the affordability of cigarettes in the selected SEE countries. We applied RIP and TAI as affordability measures, as discussed previously.

Data on RIP, defined as a percentage share of GDP per capita required to purchase 100 packs of 20 cigarettes of the most-sold brand, are retrieved from WHO GHO data.[25] As suggested by the literature,[15 26 27] we computed TAI by combining data on GDP per capita growth and price indices according to the formula:

$$TAI_{it} = rg\_pc_{it} * (cpi\_ov_{it}/cpi\_tob_{it}) - 100$$

where TAI denotes the tobacco affordability index (annual percentage change in affordability), rg_pc denotes the index of real annual growth of GDP per capita (based on constant local currency, previous year=100), while cpi_ov and cpi_tob refer to overall and tobacco CPI, respectively. Subscripts refer to the

country (i) and year (t) within the sample. The definition of the tobacco affordability index implies that if TAI <0, affordability decreases. that is, a negative TAI value indicates that tobacco products became less affordable compared with the base year. On the other hand, higher RIP means lower affordability of cigarettes and vice versa.

(b) Specification of two econometric models assessing the impact of affordability on cigarette consumption per capita, following the approach in existing cross-country empirical studies.[6 8] In model 1, we applied TAI as an aggregate affordability measure. Since TAI is defined as a rate of change in affordability, cigarette consumption per capita change is applied as a dependent variable rather than a nominal value. A decreasing value of TAI means that tobacco becomes less affordable and tobacco consumption is expected to decline relative to previous year, which implies an expectation that TAI and consumption co-vary in the same direction (positive regression coefficient). Model 1 reads as follows:

$$ac\_cig\_pc_{it} = a_0 + a_1 TAI_{it} + a_2 X_{it} + e_{it}$$

where ac_cig_pc denotes the annual percentage change of cigarette consumption per capita, while X refers to control covariates. Cigarette consumption is defined as cigarette consumption (in sticks) per adult (15+ years old) for the country i in year t.

For the sake of comparison, we specified model 2, wherein RIP was applied as an alternative affordability measure. Higher RIP indicates lower affordability, which implies an expectation that RIP and consumption co-vary in opposite directions (negative regression coefficient). Since both RIP and consumption are strictly positive values, the model is specified in log-log form so that the estimated regression coefficient can be interpreted as elasticity of affordability. Model 2 reads as follows:

$$ln\_cig\_pc_{it} = a_0 + a_1 ln\_RIP_{it} + a_2 X_{it} + e_{it}$$

where ln_cig_pc refers to the logged value of cigarette consumption per capita, and the RIP is defined as the percentage share of GDP per capita required to purchase 100 packs of cigarettes (the price of 100 packs most-sold brand/GDP per capita).

As for the covariates, we used the unemployment rate,[6] and MPOWER components.[6 28] The covariates are applied one at a time to preserve degrees of freedom and avoid issue with the high interrelatedness of tobacco control policies. In case that MPOWER tobacco control policies are interrelated, individual significance indicated by the single-policy modelling can disappear when all policies are simultaneously included in the regression.[29] The model disturbance term e is assumed to contain both individual effects and random error.

Model 1 (TAI) is estimated using a fixed effects (FE) estimator, which produces consistent estimates as long as explanatory variables are not endogenous. The fixed effects estimation is characterised by the assumption that model disturbance comprises individual effects, in this case, country-specific effects. Estimation of model 2 (RIP) using the FE estimator ends up with the overestimated impact of affordability, suggesting the presence of endogeneity within this model specification. Therefore, we estimated the dynamic version of model 2 (the first lag of tobacco consumption is included in the set of regressors) using the Arellano-Bond GMM estimator, which is typically applied to estimate the dynamic specification of panel models. The latter approach substantially improved model 2 estimation results.

RESULTS

During the period 2000–2016, all observed countries experienced a dynamic average annual growth rate compared with the average for the 28 (at the time) EU member countries (EU-28).
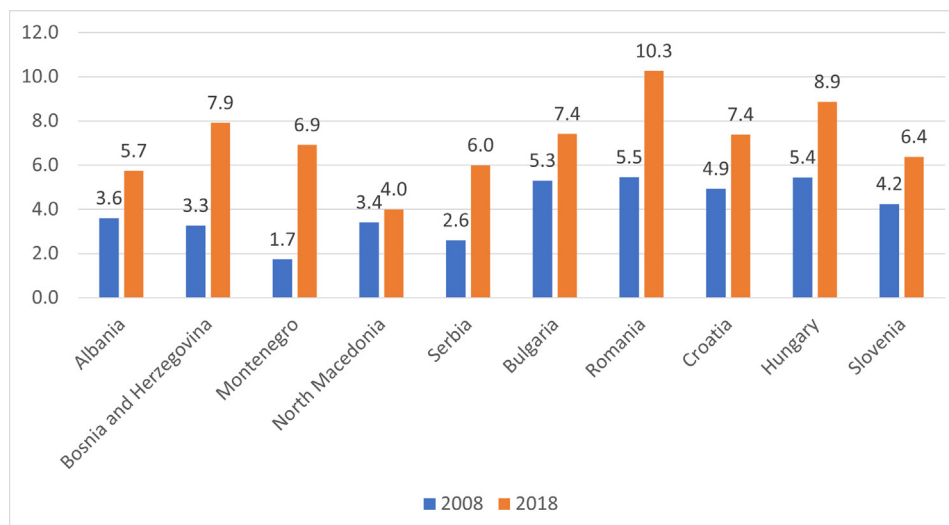
Figure 1 Real prices of the most-sold cigarette brands, 2008 vs 2018 (2017 international $). Source: authors' calculations using WHO and IMF data. Note: WHO Global Health Observatory biannual data on retail prices for a pack of 20 cigarettes expressed in local currency converted to the international 2017 US$ using IMF World Economic Outlook database.

This growth contributed to the acceleration of these economies' attempts to catch up with their higher-income counterparts, particularly before the global financial crisis of 2008–2009. However, they still significantly lag behind the 'old' EU members. To illustrate, Slovenia, as the most developed out of the analysed economies, recorded a real GDP per capita level of 82.1% of the EU-28 average in 2016, followed by Hungary (70.6%) and Croatia (60%). WB economies, on the other hand, were clearly below 50% of the EU-28 GDP average, with Albania and BiH holding the last place (31.2% of the EU-28 average).[30]

Real prices of the most-sold cigarette brands (figure 1) have increased in all selected SEE countries over the period 2008–2018. The most dynamic growth was recorded in Montenegro, where cigarettes became almost three times more expensive over the 10-year period. Prices also increased significantly in BiH (142%) and Serbia (130%). On the other hand, real prices in North Macedonia and Bulgaria grew only by about 17% and 40%, respectively. Overall, real cigarette prices experienced dynamic growth over the first post-crisis years during the period of economic recovery (2010–2014), after which trends stabilised (2016–2018).

The affordability measured by RIP, that is, as the share of GDP required to buy 2000 cigarettes of the most-sold brand, is the highest in Slovenia and North Macedonia, with 1.7 and 2.6% of GDP per capita, respectively (figure 2). The lowest affordability is observed in BiH and Albania, with 5.9% and 4.2% of GDP per capita, respectively (figure 2). Affordability trends recorded relatively different patterns over the observed period. After relatively strong decreases in affordability, 3.4% of GDP per capita was required to buy 2000 cigarettes in Montenegro in 2018, compared with 1.00% in 2008. Similar trends are observed in BiH, where the price of 2000 cigarettes in 2008 accounted for 3.0% of GDP per capita and 5.9% in 2018. With the exception of North Macedonia, decreases in affordability in 2018 compared with 2008 are observed in all other countries.

Systematic differences in affordability trends between SEE countries that are EU member states and those that are still candidates over the covered period get visible when patterns of RIP and real prices dynamics are considered at the level of individual countries (figure 3). In Albania, BiH, Montenegro and Serbia, real prices have been steadily growing, but at an insufficiently high pace to compensate for the increase in income.
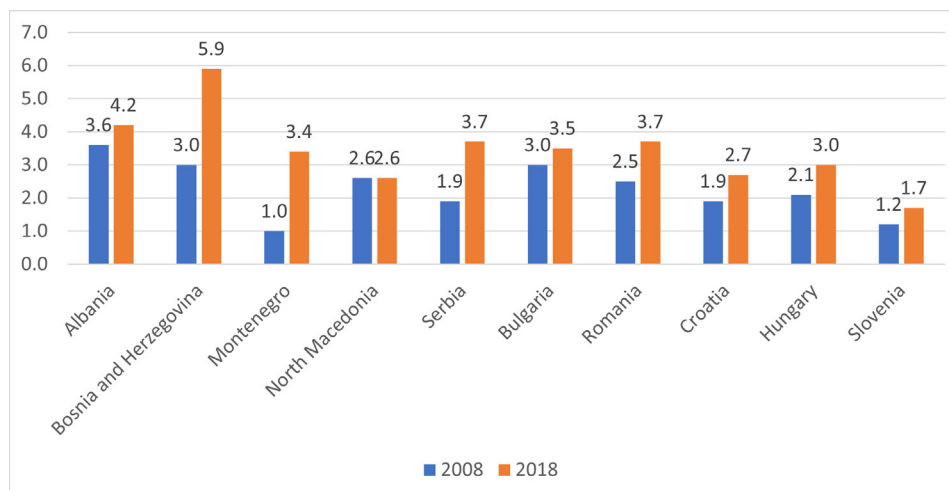

Figure 2 Trends in relative income price, 2008 vs 2018 (%). Source: WHO Global Health Observatory data.
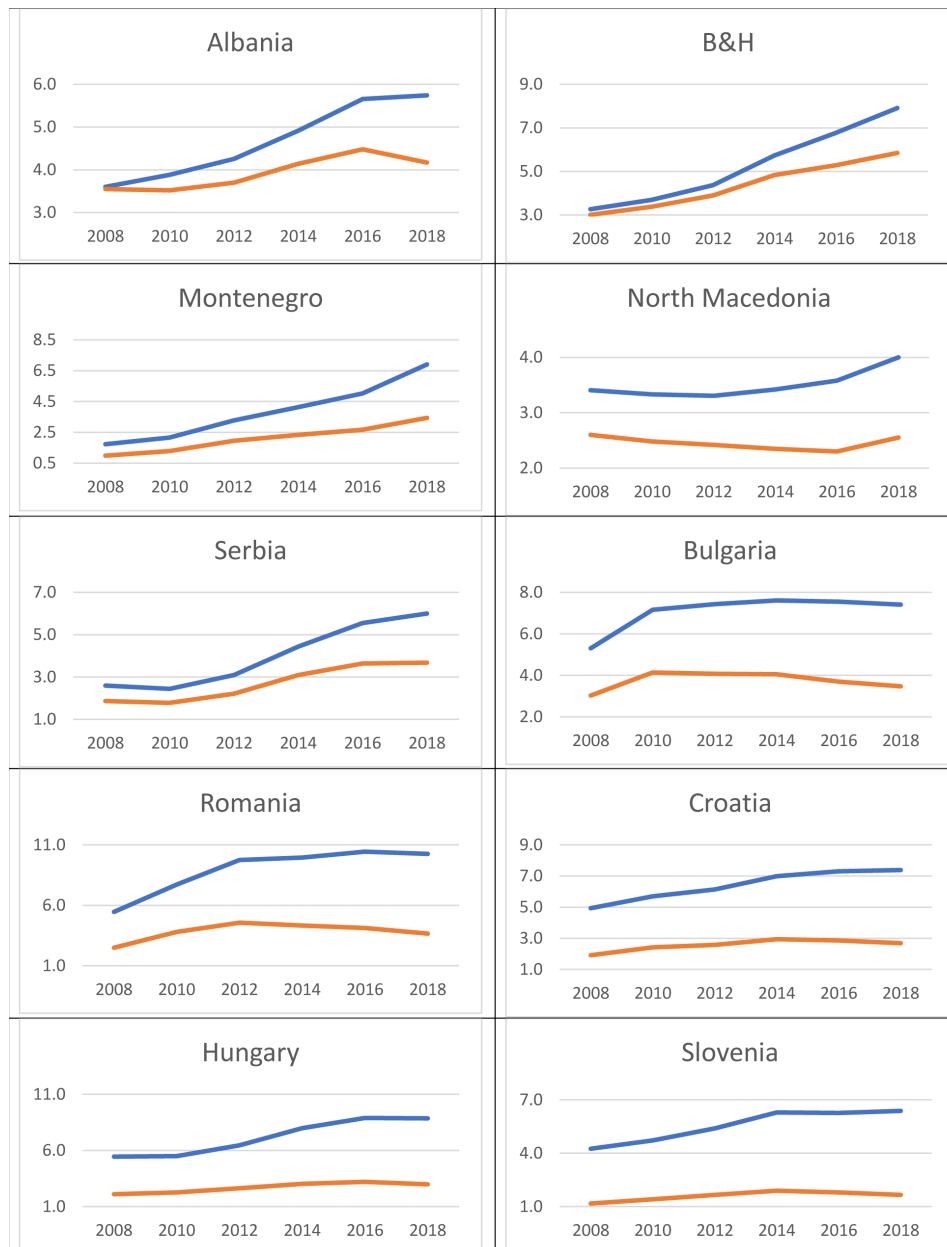
Figure 3 Real price (blue line) vis-à-vis Real Income Price (orange line) trends in SEE countries. Source: WHO Global Health Observatory data and authors' calculations using WHO and IMF data.

Therefore, the fall in cigarette affordability in those countries was very dynamic, but the gap between growth in real prices and affordability has deepened over time. On the other hand, in five SEE EU member states, cigarette affordability was either stagnating or slightly increasing after 2013, corresponding to a very slight increase in real prices of cigarettes (in case of Bulgaria prices even decreased slightly).

Differences in affordability trends between SEE EU member states and candidates correspond to the pattern that has been observed between the EU old and new member states (new member states—those countries that joined EU in 2005 or after). More specifically, in 2010, the EU increased the tax requirements for member states, raising the excise tax burden to 60% and raising the excise tax floor by 41% to €90 per 1000 cigarettes. This resulted in a more dramatic rise in cigarette prices in new member states while the increases in existing member states were smaller, as all 15 old member states met

the excise tax floor stipulated by the Directive.[31] Subsequently, the difference in affordability narrowed down between the old and new member states, although cigarettes remained considerably cheaper in new member states. The observed difference between real prices and affordability between SEE EU members (new member states that have harmonised taxation policy in the meantime) and candidates (that are currently harmonising tax policy with EU directives) mirrored those between old and new member states observed 10 years ago. It confirms that joining the EU is beneficial for tobacco control, as harmonisation with directives results in significant increases in excise taxes and prices, mainly imposed the high excise tax floor as prescribed by EU directives, and subsequent decline in affordability.[32] Analysis based on TAI shows that change in affordability strongly depends on income changes. Following the onset of the global crisis in 2009, all analysed countries except Albania experienced GDP per capita decreases, which influenced sharp decreases in

Table 2 Trends in TAI, 2009–2020 (%)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ALB	1.15	−0.88	−9.86	−1.42	−4.63	−7.19	0.74	5.46	4.90	2.24	3.32	0.49
BiH	n.a.	n.a.	−5.66	−10.87	−5.47	−10.44	−3.89	−5.87	−2.31	−3.89	−3.40	n.a.
BUL	−19.33	−21.46	2.52	3.43	0.92	−0.25	2.78	0.31	3.15	1.93	4.78	−3.78
CRO	−19.10	−2.63	−5.90	−3.10	−8.43	−6.82	0.76	3.59	2.83	1.81	−1.21	−11.06
HUN	−10.88	−3.62	9.01	−14.15	−12.29	−8.88	0.63	−1.21	−0.11	0.49	−2.95	−11.16
MKD	−0.93	3.50	4.02	1.21	2.90	−0.59	−3.78	−3.57	−5.55	−2.21	−3.04	−4.54
MNE	n.a.	n.a.	n.a.	−19.14	−5.56	−3.61	2.85	−1.04	−4.23	−17.26	10.77	−5.47
ROM	−20.33	−27.41	−1.46	0.44	−1.63	−2.01	−0.99	−0.06	5.98	2.92	0.82	−8.55
SLO	−12.42	−6.08	−3.98	−6.83	−7.71	−1.52	−1.24	2.92	2.59	4.95	2.68	−8.64
SRB	−13.87	−4.62	−3.44	−7.57	−14.05	−11.92	6.04	−4.23	−2.80	−0.66	−0.75	−5.86

Source: authors' calculations using national statistics and EUROSTAT data.

tobacco affordability (table 2). However, as soon as the global economy started recovering (2011–2012), tobacco affordability stabilised and even increased in North Macedonia and Bulgaria. Episodes of sharp affordability decreases due to policies recommended by WHO and the World Bank were quite rare, occurring only in Montenegro (2012 and 2018), Serbia (2013–2014), BiH (2012 and 2014) and Hungary (2012–2013).

Tables 3 and 4 present the estimation results for model 1 and model 2, respectively. Model 1 results confirm the positive relationship between the TAI and consumption. The impact of affordability on cigarette consumption is estimated in the range of 1.1–1.3, indicating that a decrease in affordability (measured by TAI) by one percentage point is associated with an approximately 1.2 percentage point decrease in annual consumption. Model 1 shows that the effects of other tobacco control policies, both individually and in the aggregate, are negligible compared

with the effects of affordability. The same holds for unemployment. The estimated explanatory power of model 1 implies that variations in TAI explain around 34% of the variation in cigarette consumption per capita.

Estimated results for model 2 also provide robust evidence of the association between affordability and cigarette consumption. Estimations of the affordability elasticity in table 4 are in the range between −0.6 and 0.7 (a decrease in affordability by 1% is associated with a decrease in consumption by 0.65% approximately). Again, neither the effects of unemployment nor the effects of other tobacco control policies approximated with MPOWER components proved to be significant. R-Squared is not available when the model is estimated using the GMM type of estimator; however, the Sargan and Hansen tests of instruments overidentification suggest that the model is well fitted.

Eventually, we run a regression with the price and income as independent variables. More specifically, we decompose the RIP into the price of the most-sold brand of a cigarette pack

Table 3 Effects of cigarette affordability on per capita consumption (model 1)

	M	P	O	W	MPOWER
TAI	1.1291***	1.1113***	1.2087***	1.1519***	1.1299***
	(0.1629)	(0.1544)	(0.1729)	(0.1668)	(0.1598)
l_unemp	−0.0147	−0.0169	−0.0292	−0.0405	−0.0223
	(0.0240)	(0.0346)	(0.0371)	(0.0299)	(0.0357)
M	0.0234				
	(0.0337)				
P		0.0129			
		(0.0174)			
O			0.0778		
			(0.0627)		
W wer				−0.0292	
				(0.0204)	
MPOWER					0.0033
					(0.0144)
_cons	−0.0498	−0.0116	−0.2441	0.1789*	−0.0277
	(0.1176)	(0.1037)	(0.2709)	(0.0856)	(0.3634)
No of obs	88	88	88	88	88
R-Squared	0.34	0.34	0.36	0.34	0.34

Source: authors' calculations. Standard errors in parentheses. M—monitor tobacco use, P—protect people from smoke, O—offer help to quit, W—warn about the dangers of tobacco, E—enforce bans on tobacco marketing, R—raise taxes on tobacco, MPOWER—composite indicator; the 'E' component of MPOWER is omitted due to lack of variation and R component due to the collinearity with change in prices. Estimated using Fixed Effects estimator.
*p<0.1, **p<0.05, ***p<0.01.

Table 4 Effects of cigarette affordability on per capita consumption (model 2)

	M	P	O	W	MPOWER
lnRIP	−0.5894***	−0.6270***	−0.6986***	−0.6384***	−0.6161***
	(0.1824)	(0.1715)	(0.1886)	(0.1752)	(0.1636)
l_unemp	−0.0330	−0.0104	−0.0460	−0.0266	−0.0091
	(0.0827)	(0.0716)	(0.0638)	(0.0790)	(0.0738)
M	−0.0732				
	(0.0974)				
P		−0.0256			
		(0.0671)			
O			0.1294		
			(0.1095)		
W				−0.0717	
				(0.1410)	
MPOWER					−0.0090
					(0.0187)
_cons	5.7749***	5.5873***	4.1203***	5.6320***	5.6479***
	(1.2528)	(1.6531)	(1.5996)	(1.6847)	(1.5060)
Sargan p value	0.187	0.119	0.271	0.144	0.116
Hansen p value	0.512	0.457	0.406	0.464	0.461
No of obs	91	91	91	91	91

Source: authors' calculations. Standard errors in parentheses; M—monitor tobacco use, P—protect people from smoke, O—offer help to quit, W—warn about the dangers of tobacco, E—enforce bans on tobacco marketing, R—raise taxes on tobacco, MPOWER—composite indicator; the 'E' component of MPOWER is omitted due to lack of variation and R component due to the collinearity with change in prices. Estimated using Arellano-Bond GMM estimator. Sargan and Hansen tests of instruments overidentification (H0: overidentifying restrictions are valid) are displayed at the bottom of the table.
*p<0.1, **p<0.05, ***p<0.01.

Table 5 Effects of cigarette prices (the most-sold brand) and income (GDP per capita) on per capita consumption (model 2)

	National currency	International USD
Price (logged)	−0.6385***	−0.6431***
	(0.1928)	(0.2015)
GDP per capita (logged)	0.4753***	0.4288**
	(0.1700)	(0.1715)
_cons	2.0884	2.5276
	(3.4118)	(3.2074)
Sargan p value	0.215	0.232
Hansen p value	0.703	0.680
No of obs	91	91

Source: authors' calculations. Standard errors in parentheses. Estimated using Arellano-Bond GMM estimator. Sargan and Hansen tests of instruments overidentification (H0: overidentifying restrictions are valid) are displayed at the bottom of the table.
*p<0.1, **p<0.05, ***p<0.01.

and GDP per capita (as a measure of income). Insight into separate effects of prices and policy is potentially important from a policy perspective since cigarette prices are influenced by taxation policy, while income is rather exogenous relative to prices. Two versions of this regression are estimated using price/GDP in national currency and international dollars (table 5). The price elasticity is estimated at around −0.65, quite close to the values of affordability elasticity, while income elasticity is estimated at around −0.45.

DISCUSSION

In this study, we analyse cigarette affordability in ten SEE countries using two affordability measures: RIP and TAI. In strict mathematical terms, the TAI, as defined in Data and methods section, simply corresponds to the inverse rate of change in real income price. However, our research still benefits from the separate computation of TAI and RIP for two reasons. First, two different measures of cigarette prices are comprised: retail price of a pack of the most-sold cigarette brand (WHO GHO) by RIP and the CPI of tobacco (EUROSTAT/national statistics) by TAI (values of GDP per capita applied in the computation of TAI and RIP are likely identical). Second, RIP is computed and reported by WHO once in 2 years (in even years), while TAI is possible to compute year by year since the values of the tobacco CPI are reported on an annual basis. It should be noted that tobacco affordability is thought of as the availability of the cheapest cigarette brand, so in this regard RIP/TAI based on the price of the most-sold brand or tobacco CPI are imperfect measures of affordability. However, the lack of data on the cheapest brands imposes consideration of other tobacco price metrics in affordability computation.

A comparison between real cigarette prices (figure 1) and relative income prices (figure 2) shows that cumulative changes in affordability in the SEE region over the covered period were heavily influenced by the income changes (approximated with GDP growth per capita). In all of the selected SEE countries, the increase in prices imposed by the excise policy was to a certain extent offset by the increase in income. The most notable example is Romania, where real price of cigarette pack almost doubled, while RIP increased by less than 50%. Year-by-year analysis of affordability changes measured by TAI (table 2) also confirmed this observation. In the recession period (2009), affordability decreased in all observed countries. However, in periods of economic growth (2017–2018), affordability was mostly stable or even increased in some countries (ALB, BUL, ROM, SLO).

A comparison of affordability trends, measured by RIP (figure 2), between the country groups also provides several significant findings. In the period 2008–2020, the selected SEE countries recorded relatively similar growth rates. Romania and Albania achieved the highest average annual growth of around 2.3%, whereas Croatia and Slovenia recorded the slowest growth with −0.3% and 0.6%, respectively. On the other hand, the decrease in affordability of tobacco products was on average higher in WB countries (which are not EU member states) than in EU member states, with the notable exception of North Macedonia. More specifically, the average annual growth of RIP in WB countries was around 5.7%, opposite to 3.3% in EU member states. It indicates that the rise in cigarette prices in WB countries was proportionally much higher in WB than in EU member states with respect to income. In addition, among 10 selected SEE countries, 7 belong to LMICs. The average annual growth of RIP in those countries over 2008–2018 was around 4.9%. It is substantially higher annual growth than observed on the much larger sample of LMICs over a similar period, about 1.1% (5).

The explanation of the previous findings is closely associated with more strict tobacco control regulations, including mandatory excise policy, imposed by the EU directives. The EU member states within the selected SEE countries have already harmonised their excise policies before or in the early phase of EU accession. The WB countries, either official EU candidates or aspire to become candidates, have been harmonising their excise policies over the period covered, resulting in a sharper rise in prices and subsequent fall in affordability of cigarettes. From that point of view, membership in the EU appears beneficial to reducing the affordability and consumption of tobacco products, especially for the LMICs within the sample.

The more profound analysis of affordability dynamics, measured by the TAI (table 2), also reveals some interesting findings. Apart from BiH, where affordability was steadily decreasing over the covered period, in all other SEE countries, episodes of affordability rise or stagnation were observed. It clearly implies that excise policy in SEE countries does not consider income dynamics. The notable examples are Croatia and Slovenia, where a lack of synchronisation between changes in income and cigarette prices resulted in a prolonged period of tobacco affordability increase.

In line with previous research,[6 33] the results we obtained by applying two econometric models confirm that affordability is the most important determinant of tobacco consumption. Model 1 shows that a decrease in affordability (measured by TAI) by one percentage point results in a 1.2 percentage point decrease in annual consumption. Model 2 estimates affordability elasticity at around −0.65, indicating that a decline in affordability by 1% results in a decrease in consumption by 0.65%, which is even more robust compared with model 1. The estimated regression coefficients indicate that making cigarettes less affordable considerably reduces their consumption. Nevertheless, this finding needs to be taken cautiously, as estimated regression coefficients are slightly higher than those found in existing studies.[6 7] Estimated affordability elasticities in their work vary from −0.57 to −0.2, indicating a possible overestimation of the impact of affordability on tobacco consumption in our study. The issue of overestimation is likely associated with the limited coverage of countries and period and econometric concerns discussed later on.

Estimates of the alternative specification with prices and income as independent variables indicate that price elasticity

is close to the -0.65 estimate of affordability elasticity, while income elasticity is estimated at around 0.45. The estimate of price-inelastic demand for cigarettes seems reliable, as most estimates for the price elasticity fall into the range from -0.25 to -0.5 for high-income and -0.5 to -1 for LMICs.[34] It also corresponds to the existing estimates of price elasticity in SEE countries from country-specific studies based on the microeconometric analysis.[16 35 36] The separate estimates of the price and income effects highlight that the price and income elasticities did not simply add up to affordability elasticity. Therefore, the affordability elasticity should be considered as a single metric, and the price and income elasticities as separate metrics, which is important from a policy-making perspective.

Given the obtained results, affordability should be the paramount consideration when designing tobacco taxation policies. Therefore, in line with WHO and World Bank recommendations, we propose the following two policy changes, which could result in significant improvements for the overall effectiveness of tobacco control policy in the SEE region:

▶ Use of tobacco affordability indicator when designing tobacco taxation policy with an aim to monitor annual affordability changes. The tobacco affordability indicator should monitor not only price changes of the most popular brands but also other relevant prices, such as the price of the cheapest brand and brands of relevant alternative tobacco products (such as roll-your-own tobacco);

▶ In countries that apply a tobacco excise calendar policy, such calendars should be reformed by including the affordability index, which would prevent increases in the affordability of tobacco products in periods of high economic growth.

In both models, we used as covariates unemployment and tobacco control policies approximated with MPOWER indicators, both individually and in aggregate. In line with previous research, the results confirmed that the effects of other control policies and unemployment are negligible compared with affordability. Although this research did not confirm their significant influence on consumption compared with affordability, other policies (MPOWER) should not be neglected when designing effective tobacco control policy. There are many policy evaluations that confirm the effectiveness of well-designed comprehensive tobacco control programmes, and some which also show that the effects of tobacco taxation are often enhanced when part of such programmes.[37] Despite relatively low variations in MPOWER scores among the observed countries, there is plenty of room for further improvements in implementation of non-price tobacco control policies, particularly in BiH, Montenegro and Serbia, where policies still fall short of meeting WHO recommendations.

The main limitation of our research is a small number of observations stemming from the limited coverage of countries and time period, which constrains our analysis in several ways. First, we could not conduct econometric analysis on the subsample levels, for example, to estimate and compare the impact of affordability on tobacco consumption between middle-income and high-income SEE countries or SEE EU member states and candidates. Second, a small number of observations restricts the number of regression parameters that could be reliably estimated due to the large loss of degrees of freedom. Therefore, estimates of the model wherein affordability measures and covariates are included simultaneously or the use of more advanced econometric methods that impose additional loss in degrees of freedom might not produce reliable estimation outcomes. The latest is most likely why we observed the affordability elasticity of cigarette consumption that seems to be slightly overestimated compared with similar work. In addition, limited coverage of countries and time period resulted in low between and within variations in values of MPOWER indicators, which is the most probable reason why other tobacco control policy dimensions appear as insignificant covariates.

CONCLUSIONS

Our study shows that from 2008 to 2019, cigarettes have become less affordable in the SEE region, but affordability trends varied across the countries. In some countries, affordability remained constant (North Macedonia) or recorded a negligible decrease (Bulgaria), while in others, cigarettes have become significantly less affordable (Montenegro and BiH). Affordability has been confirmed as the most significant determinant of tobacco consumption in the SEE region. At the same time, estimated regression coefficients indicate that making cigarettes less affordable considerably reduces their consumption.

Despite its significance, affordability is still not considered when designing national tobacco taxation policies. For instance, with stronger economic growth (2017–2018), affordability in most observed countries increased slightly. Therefore, policymakers should be aware of the risk that future increases in cigarette prices could lag behind real income growth, making tax policy less effective at reducing consumption. Reducing affordability should be the paramount consideration in designing effective tobacco taxation policies.

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