Tobacco Tax Pass-Through in Montenegro

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Ana Mugoša,* Mirjana Čizmović, Milica Kovačević,****

Ivana Ivanović,* Violeta Vulović*****

* Faculty of Economics, University of Montenegro, and Institute for Socio-Economic Analysis, Podgorica, Montenegro

** Faculty of Business and Economics, Mediterranean University, and Institute for Socio-Economic Analysis, Podgorica, Montenegro

*** Institute for Socio-Economic Analysis, Podgorica, Montenegro

****Institute for Health Research and Policy, University of Illinois Chicago, United States of America

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Correspondence to: Ana Mugoša, ana.mugosa@ucg.ac.me

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Abstract

Background

The main goal of this study is to estimate the pass-through effect of taxes, which enables us to understand tobacco industry pricing strategies and how taxes are passed on to consumers. This evidence is important when developing effective tobacco control policies since taxes make up a considerable portion of retail cigarette prices.

Methodology

To estimate the existence of under or over-shifting of tobacco excise tax, we use brand-level price data for brands of manufactured cigarettes traded in Montenegro between 2010 and 2022. The analysis uses an unbalanced panel-data quantile regression approach, through which different pass-through aspects can be analyzed at specific points of the entire price distribution. The advantage of this type of regression is found in the importance of analyzing the pricing strategies' impacts on the lowest and highest quantiles (prices) that is, how specific quantiles respond to the changes. In this way, the market is broken down by consistent endogenous quantiles. Additionally, to estimate the pass-through effect by defined market segments, the analysis applies panel fixed/random models.

Results

Using the quantile regression to estimate the rate of tax pass-through, under-shifting is found to be present in the lower quantiles, that is, the group of the cheaper and most widely sold products. Slim cigarettes, on average, have lower prices, thus are more affordable compared to other types of cigarettes. The magnitude of the over-shifting is greater at the higher quantiles, or the premium brands. Similar results are obtained by the regression conducted by market segments. Additionally, estimates suggest that slim cigarettes are cheaper compared to other cigarette types and that their prices are not increased beyond the tax increase.

Conclusions

The tobacco industry employs a variety of pricing strategies, using different tactics to balance their business and profits. These tactics differ in relation to market segments of tobacco products and balance between volume and price, which enables the industry to keep generating high profit margins in Montenegro while maintaining the wide price gap between premium and cheaper tobacco products. This paper contributes to the current empirical evidence related to the estimation of pass-through of taxes, which can serve as a basis for policy makers to design effective tobacco taxation policy.

JEL Codes: I13, I18, H22

Keywords: Excise taxes, pass-through of taxes, market segments, quantile regression analysis

Introduction

The tobacco industry applies different pricing and marketing strategies to weaken the effect of tobacco taxation policies, such as shifting prices among brands in relation to tax changes, introducing new cheaper products to allow smokers to "down-trade," implementing price promotions, and utilizing gradual price increases to smooth the effect of larger price rises. The most utilized strategy is arguably under- and/or over-shifting tax increases, meaning that the tobacco industry increases the price of tobacco products less/more than a tax increase requires, potentially affecting the effectiveness of tobacco tax policy for public health.

The available data on prices in Montenegro show higher variability in prices of premium brands compared to the mid-price and economy brands. This implies that the industry tends to over-shift on relatively more expensive brands, while, in contrast, it is more likely to under-shift on the less expensive ones. The industry pricing strategy focus is also on different types and characteristics of brands. The tobacco market in Montenegro currently consists of approximately 100 different brands, with evident market changes in the last decade such as new brands or variants entering/exiting the market and the emergence of low-priced illicit tobacco products (Tobacconomics, 2023).

Vast empirical evidence from many countries confirms heterogeneous industry pricing strategies and excise tax pass-through across market segments. The literature shows that over-/under-shifting of taxes is often applied differently in high-income (HIC) versus low-and middle-income (LMIC) countries. In HIC, the tobacco industry mainly acts to widen the price gap between tobacco market segments by increasing the price of premium products more than is required, while keeping products in economy segments affordable by under-shifting tax increases. (Apollonio & Glantz, 2020; Gilmore et al., 2013; Marsh et al., 2016; Shirane et al., 2012; Y. Wang et al., 2021; Wilson et al., 2021a). In LMICs, the tobacco industry usually absorbs a great portion of the tax increase in all market segments to expand their markets, thus losing higher profits in the shorter term. Moreover, in the case of market disturbances, such as a larger share of illicit tobacco products, research suggests that the pricing strategy is

switched from over- to under-shifting, to maintain prices on a competitive low level (Adrison & Putranto, 2018; Cevik, 2018; Juárez et al., 2014; Linegar & van Walbeek, 2018; Prasetyo & Adrison, 2019).

Evidence of how industry pricing strategy is applied to different brands and market segments can significantly contribute to a more precise estimation of an excise tax policy's effects on government revenues and on overall reductions in cigarette consumption. Since taxes make up a considerable portion of retail cigarettes prices, understanding the tobacco industry pass-through strategy is important when creating an effective tobacco control policy. Therefore, the main goal of this study is to estimate the pass-through effect, especially knowing that there is a lack of this type of research in Montenegro and in the Western Balkan region.

Methodology

Data

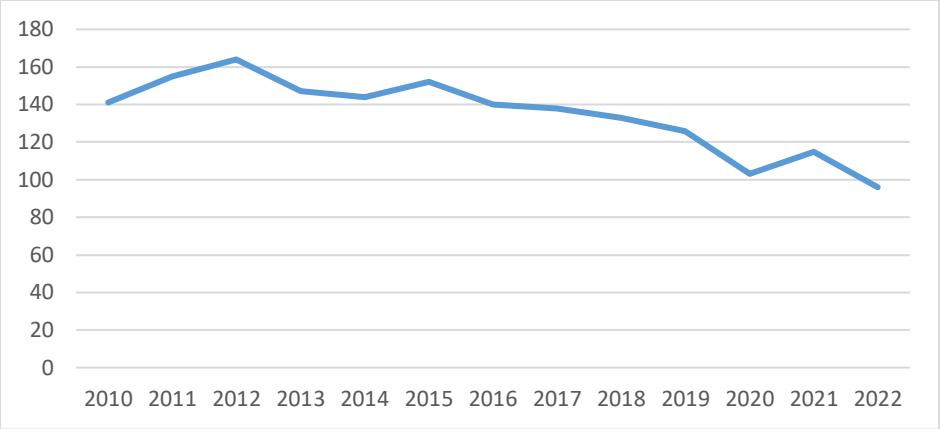
To estimate the existence of under- or over-shifting of tobacco excise tax, we use data from the Tobacco Agency[1] related to price per pack of manufactured cigarette brands traded in Montenegro between 2010 and 2022. We exclude other types of tobacco products due to data unavailability, but since cigarettes represent 95.3 percent of total tobacco consumption in Montenegro (Mugoša et al., 2020) this does not significantly impact the relevance of the results. The provided database contains monthly information on prices and cigarette sales by brands, given in kilograms and tons. All brands in the analysis are sold in packs of 20 cigarettes, which is the standard size of a cigarette pack in Montenegro.

The industry structure has not changed significantly recently with the tobacco market mainly dependent on imports (ten importers), with no domestic production. The number of different brands (including brand variants, in total 269 in our sample) in the

[1] The Directorate in Ministry of Finance responsible for issuing authorisations for the production, processing and trade of tobacco products.

Montenegro cigarette market has demonstrated a declining trend since 2012, ranging from 143 in 2010 to 96 in 2022 (Figure 1).[2]

Figure 1. Number of cigarette brands by year 2010–2022



Source: Tobacco Agency, Montenegro

Price data from the Montenegrin government are provided on a monthly level. In those cases when prices changed more than once in a year, those changes typically coincided with the month when the change of excise calendar came into force, while between subsequent excise tax increases, prices of the brands were mostly invariant. Accordingly, the main dependent variable in study will be retail price of different brands per month in the period, 2010–2022.

In Montenegro, a mixed excise tax system is applied, including a specific excise tax and an ad valorem excise tax based on retail prices (Table 1). In 2023, the specific excise tax increased twice, reaching 49 euros per 1,000 sticks of cigarettes starting July 1, while the ad valorem continues at 24.5 percent of the retail price. The weighted average retail price of cigarettes (WAPC) increased gradually since 2010, reaching 2.7 euros in 2023.

[2] Brands that have negligible market share are excluded from the analysis (less than one percent).

Table 1. The excise tax calendar 2010–2023

Year	Specific excise tax in euros	Ad valorem excise tax %	WAPC	VAT
2010	5	35	0.6	17
2011	10	37	1	17
2012	15	36	1.2	17
2013	17.5	35	1.3	19
2014	19	35	1.55	19
2015	20	34	1.7	19
2016	22	32	1.8	19
2017	24	33	1.9	19
2017	30	32	2.1	19
2018	40	32	2.1	21
2019	30	32	2.1	21
2020	33.5	30.5	2.1	21
2021	37	29	2.5	21
2022	40.5	27.5	2.6	21
2022	44	26	2.6	21
2023	47.5	24.5	2.7	21
2023	49	24.5	2.7	21

Source: Law on Excise Taxes, Tobacco Agency

The most-sold brands during the observation period were dominantly imported ones, with the price ranging from 0.6 to 2.6 euros (Table 2). The data confirm that the prices were very low, which contributed to higher affordability of these products. Low prices and high cigarette consumption strongly suggest that tobacco taxes could still be increased significantly.

Table 2. Prices of most-sold, premium, and cheapest brands, 2010–2022

Year	The most-sold brand	Price (euro)	Premium brand	Price (euro)	Cheapest brand	Price (euro)
2022	Winston XStyle long blue	2.6	Marlboro	3.5	Fast revolution 8	2.1
2021	Winston XStyle long blue	2.5	Marlboro	3.4	Una slims gold	2
2020	Winston XStyle long blue	2.4	Marlboro	3.3	LD Club compact blue	2
2019	Winston XStyle long blue	2.3	Marlboro	3.4	LD red	1.8
2018	Winston XStyle long blue	2.3	Marlboro	3.4	Code red	1.6
2017	L&M loft blue	2	Marlboro	3	Negro	1
2016	L&M loft blue	1.8	Marlboro	2.7	Negro	1
2015	Ronhill wave black	1.6	Marlboro	2.6	Negro	1
2014	Ronhill wave black	1.5	Marlboro	2.5	York YLB hard pack	1
2013	Code blue	1.3	Marlboro	2.4	York YLB hard pack	1
2012	Drina denifine	1.2	Marlboro	2.2	Monte crni	0.75
2011	Drina denifine	1	Marlboro	2	Monte crni	0.5
2010	Drina denifine	0.7	Marlboro	1.7	Cuba	0.4

Source: Tobacco Agency, Ministry of Finance
Note: Prices are given in current values. Real values are given in Table A1 in the Appendix.

With a minimum excise rate in 2023 of 82.1 euros per 1,000 cigarettes, Montenegro is still below the minimum threshold set by the European Union Tax Directive of 90 euros per 1,000 cigarettes. To combat the negative effects that the use of tobacco products has on the health of citizens, further harmonization of excise duties on cigarettes with the requirements of Directive 2011/64/EU is needed.

To estimate the tax pass-through, the key independent variable is expected price of cigarettes per pack *P(e)* by brand, which represents a hypothetical price estimated under an assumption of a full tax pass-through (that is, passing exactly 100 percent of the burden of the tax increase on to consumers). To estimate the expected price, we relied on the structure of the tax system in Montenegro, according to which the price

consists of the specific excise per pack, the ad valorem excise as a percentage of retail price, the value-added tax (VAT), and the net-of-tax amount per brand (NOT). The first step in the analysis is to estimate the NOT in the baseline period *t* (the month when the cigarette brand entered the market in the observed period), using the data on the brand retail price, excise taxes, and VAT for the same period (Equation 1):

$$NOT_{it=1} = \frac{P_{it=1}}{(1+VAT\%_{t=1})} - SE_{t=1} - ADV_{t=1} \quad (1)$$

where *P* stands for retail price per pack, *SE* is the specific excise per pack, *ADV* is the ad valorem tax component calculated as a product of the ad valorem rate and retail price, with *i* representing the brand in the sample and *t* referring to the month of observation. To estimate NOT in *t+1*, we inflate it by using monthly CPI (RNOT). Using the estimated NOT and the payable taxes in each *t*, we can calculate the *P(e)* according to Equation 2:

$$P(e) = (RNOT + SE_{it} + ADV_{it}) \times (1 + VAT\%_t) \quad (2)$$

The *P(e)* in the model represents the main independent variable, impacting the brand retail price as a dependent variable.

According to the Law on Excise Taxes, in case the total excise tax per pack is lower than the minimal excise, the latter will be applied instead, which is 100 percent of the total excise duty (specific and ad valorem) determined for the category of the weighted average retail price of cigarettes. In that case, the expected price is calculated as follows:

$$P(e) = (RNOT + ME_{it}) \times (1 + VAT\%_t) \quad (3)$$

where *ME* is the amount of minimal excise. For example, the minimum total excise (specific and ad valorem tax) applied on the WAPC of 2.6 euros in 2022 was 1.56 euros.

Other control variables

The database contains detailed information regarding brand types, which allows us to categorize products by segments or attributes. As there is no official tobacco market segmentation, the segments (premium, mid-price, and economy) are determined according to the information available from the industry reports where some of the importers provide the category of brands in relation to price segment. Additionally, we use some publicly available information from retailer websites (Philip Morris International, 2023; Japan Tobacco International, 2023).[3] A similar approach has been used in other studies where market segmentation was not available (Tauras et al., 2006).

A premium brand is one with a higher price (such as Marlboro, Davidoff, Dunhill, Sobranie, and Georg Karelia & Sons) compared to all other brands. The mid-price brands are mainly the most-sold brands in the Montenegrin market (for example, Winston, Lucky Strike, and L&M). The economy brands include the packs with the lowest prices (such as York, Pall Mall, and LD). More specifically, the mid-price segment is defined as +/-25 cents of the price of the most-sold brand. The most-sold brand represents the anchor for the determination of segments. Twenty-five cents or more above the price of the most-sold brand is premium, while 25 cents or more below the price of the most-sold brand is defined as economy tier. For instance, the price of the most-sold brand in 2022 was 2.6 euros, so the range for the mid-price segment is 2.35–2.85 euros, with premium cigarettes costing more than 2.85 euros and economy cigarettes with prices lower than 2.35 euros. The segment of uncategorized brands is then determined based on their average annual price relative to the prices of the defined mid-price segment (Tauras et al., 2006).

The available data also permit the inclusion of a variable in the model that identifies cigarette types by principal component analysis of differing design characteristics. The differences between brand varieties are mostly associated with the levels of tar and nicotine and cigarette stick size. Precisely, the analysis tests how the prices of cigarettes purported to have milder taste (that is, slims) respond to tax changes compared to all other cigarette types and brands in the sample. Moreover, to assess

[3] https://www.jti.com/about-us/what-we-do/our-brands, https://www.pmi.com/faq-section/smoking-and-cigarettes

the impacts of tax changes, wages as a proxy for income and macroeconomic control variables are added.[4]

Empirical approach

To estimate the pass-through effect by defined market segments, the analysis applies panel fixed-effect models. Fixed-effects regression is a method for controlling for omitted variables in panel data, in cases in which these variables vary across entities (segments) but do not change over time. This regression can be used when there are two or more time observations for each entity. To identify whether to apply pooled OLS, fixed or random effects, Breusch and Pagan Lagrangian multiplier, Sargan-Hansen and Hausman cluster robust tests were used.[5]

The model includes interactions of expected price and dummies representing market segments, where interaction coefficients represent the estimates of the pass-through effect (Equation 4):

$$P_{it} = \beta_0 + \beta_1 \ln P(e)_{it} + \beta_2 \ln P(e)_{it} \times MS + \beta_3 \ln P(e)_{it} \times HS + \beta_4 X_t + MS + HS + \varepsilon_i + u_{it} \quad (4)$$

Here, *MS* and *HS* stand for the mid-price and premium market segments, respectively (*i* = cigarettes brands, *t* = time (monthly level)). The same methodology is applied in the estimation of pass-through by brand variants (interaction of expected price and dummies representing brand variants). The analysis in both steps will apply fixed effects by cigarette brands.

The analysis also employs a quantile regression approach with unbalanced panel data, allowing a focus on quantiles and the distributional relationship of variables by being more robust to outliers compared to the linear regression. As the tax pass-

[4] According to the relevant literature (Wang et al., 2015), the model could control for the macroeconomic impact, including annual unemployment rate, by which we can evaluate if unemployment is a significant factor in the pass-through effect. Unfortunately, these data were not available disaggregated on a monthly level.

[5] We checked for the autocorrelation (Wooldridge test), heteroscedasticity (modified Wald test), and multicollinearity (variance inflation factor). The Arellano variance estimator robust/cluster standard errors was used to deal with heteroscedasticity and correlation within IDs.

through may depend on the actual price level, the quantile regression is suitable for the estimation of this effect by quantile. One more characteristic favouring a quantile regression approach in this research is the sufficiently long period of 156 months of observations.[6]

The advantage of the analysis by quantiles is that the market can be consistently segmented by exogenously defined quantiles, and it is possible to get more detailed insight into different levels of price. Following the existing literature, we apply 11 quantiles (0.05, 0.15, 0.25, 0.35, 0.45, 0.5, 0.55, 0.65, 0.75, 0.85, and 0.95) to the price distribution. For example ≤ 0.05 represents the lowest end of the price distribution (Ally et al., 2014b; Wilson et al., 2021a). Accordingly, the following model is estimated (Equation 5):

$$P_{it} = \beta_0 + \beta_1 P(e)_{it} + \beta_2 X_t + \varepsilon_{it} \quad (5)$$

where *P* stands for brand retail price, *P(e)* is the expected price under the full pass-through assumption, and X_t represents the vector of other control variables, including a dummy variable "Slims" to account for the cigarette characteristics and monthly wages. Finally, *i* refers to cigarette brand and *t* stands for time (month).

The coefficient β_1 represents the estimated pass-through effect. For instance, $\beta_1 = 1$ means that the tax increases or changes are fully passed on to smokers. In case the value of the beta coefficient is greater than one, the industry over-shifts the tax (that is, the consumer is paying more than proportionally). In contrast, when the value of beta is less than one the consumer pays less than the actual tax increase, while the industry bears the rest of the tax burden (that is, tax under-shifting). To solve the presence of heteroscedasticity and serial autocorrelation, we compute standard errors by clustered bootstrap.

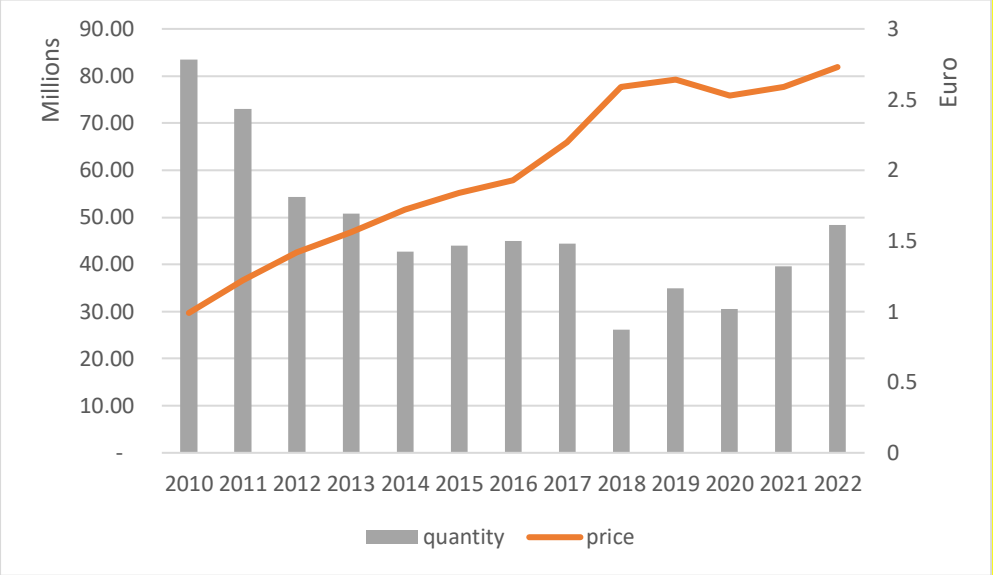
[6] Because we have a wide panel (N > T), the analysis applies standard panel methods.

Results

Descriptive statistics

The increasing trend in manufactured cigarette average price over time is presented in Figure 2. The average price is weighted using the market share of traded brands (quantity of packs sold) in the observed period. Despite an increase, the average price remained at a relatively low level compared to the European Union countries (Trenda, 2023), with an average of 2.7 euros (nominal) in 2022.

Figure 2. Average current price and quantity of cigarettes sold, 2010–2022



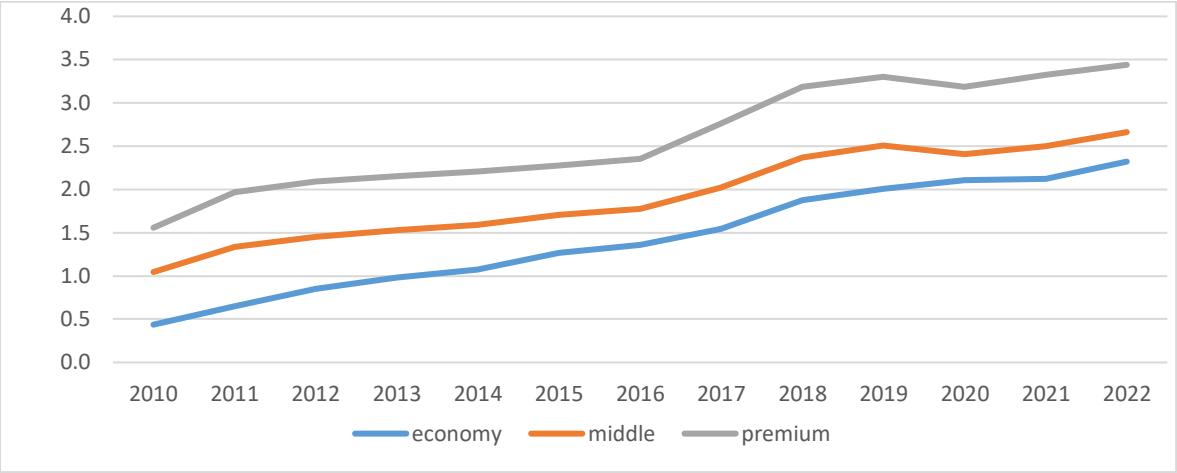
Source: Authors' calculations

Note: Price (nominal) is given per pack and quantity of cigarettes sold in packs.

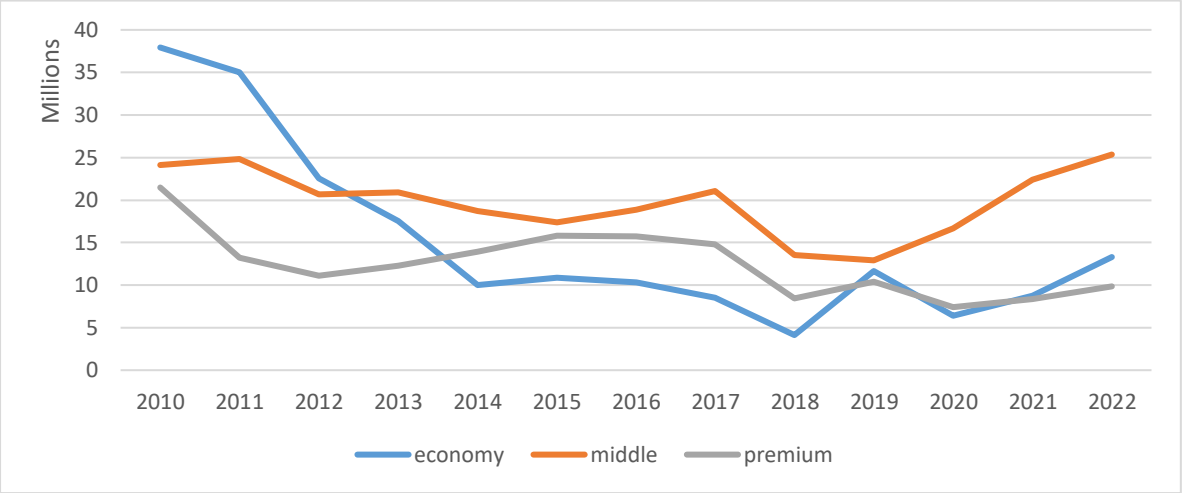
The prices among market tiers had a similar trend during the observed period. In general, there is a small difference (measured in cents) between prices in the economy and mid-price segments (Figure 3). For example, the average prices in 2022 for those two tiers were 2.3 and 2.7 euros, respectively. There was a sharp drop in quantity sold in 2018, which may be explained by the high share of illicit trade in that period (Tobacconomics, 2023).

Figure 3. Average price (Panel a) and quantity of cigarettes sold (Panel b), 2010–2022

Panel a.



Panel b.



Source: Authors' calculations

Note: Price is given per pack and quantity of cigarettes sold in packs.

Table 3 breaks down the observed retail price and quantity of cigarettes sold by quantiles. Between 2020 and 2022, the average price across quantiles suggests that cigarettes prices do not change significantly and are still close to the previous low levels. For example, the average price in the quantile band from Q_{25} to Q_{50} ranges from 2.4 to 2.6 euros, with the highest share of cigarettes actually sold in that middle quantile.

Table 3. Quantiles of price paid per pack and quantity sold, 2020–2022

	2020			2021			2022		
	Price (euros)	Quantity (millions)	Share	Price (euros)	Quantity (millions)	Share	Price (euros)	Quantity (millions)	Share
≤ Q_{25}	2.11	6.4	21%	2.12	8.8	22%	2.32	13.3	27%
Q_{25} - Q_{50}	2.41	16.7	55%	2.45	15.2	38%	2.63	20.6	43%
Q_{50} - Q_{75}	2.72	1.9	6%	2.64	8.8	22%	2.94	8.8	18%
≥ Q_{75}	3.34	5.6	18%	3.45	6.8	17%	3.68	5.7	12%

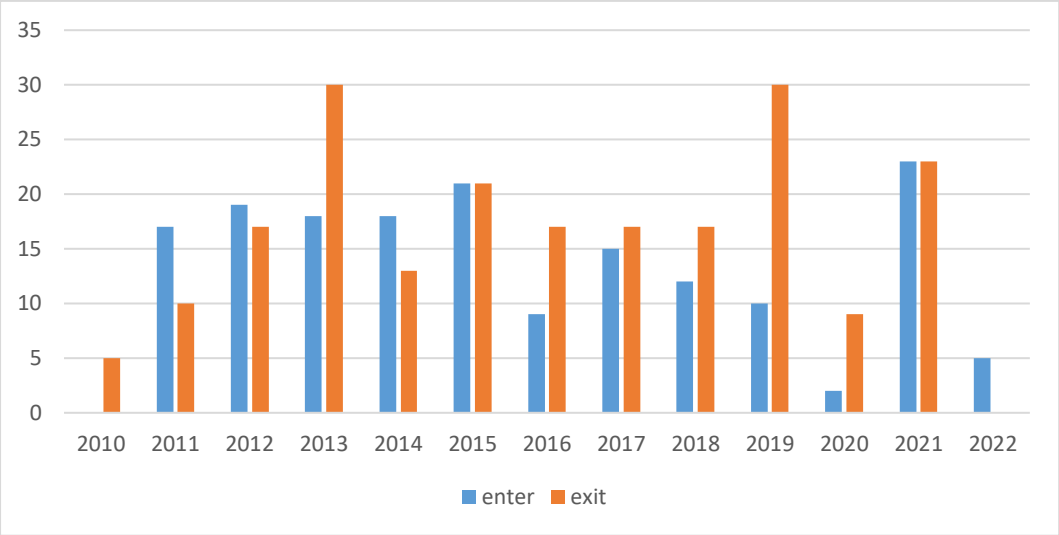
Source: Authors' calculations

Note: The data are divided by three quantiles (four quantile bands) to present the average price and shares on a more aggregated level compared to the one used in the regression. Detailed statistics for other years are given in the Appendix, Table A2.

Considering the brand varieties in this research, we include slim cigarettes as the type that is mainly used in the industry strategy focused on females and youth. Market data show that slim cigarettes are mainly concentrated in the first two tiers (economy and mid-price). It is notable that the slim cigarette share increases in the period observed in the economy tier, from 32 percent in 2010 to 54 percent in 2022 (Table A3a, Appendix). Similar results are obtained when data are divided by quantiles with the lowest share of slim cigarettes in the highest quantile (Table A3b, Appendix).

The data also allow analysis of the entrance of new brands and re-entrance of old brands that had left the market, as well as the exit of existing brands in the observed period. Generally, more brands exit the market than enter, especially in the economy tier (Table A4a and A4b, Appendix). Overall, these trends were mostly present between 2013 and 2019, and most brands that entered and exited were slims. Also, data shows that a small number (31) of brands repeatedly entered and exited the market during this period, with a similar share in all three segments.

Figure 4. Number of brands entering/exiting the market by year, 2010–2022



Source: Authors' calculations

Regression results

The estimates of pass-through by market segments illustrate the different strategic pricing policies of the tobacco industry (Table 4). There are 4 models, with Model 1 including only the expected price as an independent variable and other models that include control variables to check for parameter consistency. In the mid-price tier, there is almost full pass-through, while in the premium tier, the industry over-shifts the taxes. In contrast, under-shifting of taxes is found in the economy segment (Model 1). Model 2 gives similar results with slightly greater under-shifting in the economy and mid-price tiers. Estimates suggest that slim cigarettes are cheaper compared to other cigarette types (Model 2) and that their prices increase less than the excise tax increase (Model 3 and 4). As expected, the tobacco industry's strategy is to keep the price of the cheapest products low, while increasing the prices of more expensive brands. The consistency of the results obtained by the quantile regression is confirmed by the estimates given by the market tiers.

Table 4. Pass-through of taxes by market tiers

Variables	Model 1	Model 2	Model 3	Model 4
Expected price	0.956***	0.931***	1.069***	1.049***
	(0.004)	(0.004)	(0.002)	(0.003)
Mid-price	0.072***	0.082***		
	(0.010)	(0.010)		
Mid-price * Expected price	0.034***	0.029***		
	(0.005)	(0.005)		
Premium	-0.113***	-0.108***		
	(0.011)	(0.011)		
Premium * Expected price	0.184***	0.183***		
	(0.005)	(0.005)		
Slims * Expected price			-0.107***	-0.109***
			(0.005)	(0.005)
Slims		-0.498***	-0.388***	-0.347***
		(0.111)	(0.125)	(0.124)
Wage		0.290***		0.222***
		(0.018)		(0.020)
Constant	-0.029*	-1.909***	-0.156***	-1.592***
	(0.015)	(0.120)	(0.016)	(0.133)

Source: Authors' calculations

Using panel data quantile analysis, presented in Table 5, we estimate two models Model 1, including only the expected price as an independent variable, and Model 2 with control variables to check for parameter consistency. Depending on the model, the results vary slightly, but mainly the under-shifting is evident in the first quantiles below the median, which represents the group of cheaper products. The cigarette pass-through specific tax changes are slightly under the full tax pass-through in the first two quantiles at 0.922 (Q_5), and 0.978 (Q_{15}) in Model 1. For the remaining quantiles, there is an evident over-shifting, with the results suggesting very close to 100-percent full pass-through only in the case of the third quantile (0.999). The extended Model 2 results show a somewhat lower first quantile (0.856), suggesting higher under-shifting, which is consistently present in the first four quantiles.

Starting from the median value, the estimates show that the tobacco industry is increasing prices beyond the tax increase. Therefore, it is evident that they still do not significantly change the prices of the cheapest products, which are dominantly the most sold ones, but instead transfer the costs to the most expensive brands. As expected, widely used slim cigarettes on average have lower prices, being more affordable compared to other types of cigarettes. To conclude, the industry increases prices of slim cigarettes less than the excise tax increase, or under-shifting.

Table 5. Pass-through of taxes, by quantile regression

	Model 1		Model 2					
Quantiles	Expected price (euro)	St. dev	Expected price (euro)	St. dev	Slims	St. dev	Wage	St. dev
Q_5	0.922***	(0.021)	0.856***	(0.027)	-0.762**	(0.348)	0.808***	(0.122)
Q_{15}	0.978***	(0.059)	0.929***	(0.021)	-0.710***	(0.236)	0.552***	(0.098)
Q_{25}	0.999***	(0.023)	0.955***	(0.020)	-0.692***	(0.203)	0.458***	(0.096)
Q_{35}	1.015***	(0.022)	0.980***	(0.019)	-0.673***	(0.179)	0.368***	(0.099)
Q_{45}	1.034***	(0.022)	1.009***	(0.019)	-0.653***	(0.165)	0.266**	(0.106)
Q_{50}	1.042***	(0.021)	1.022***	(0.019)	-0.643***	(0.164)	0.221**	(0.107)
Q_{55}	1.051***	(0.021)	1.037***	(0.018)	-0.633***	(0.168)	0.166	(0.111)
Q_{65}	1.069***	(0.021)	1.064***	(0.018)	-0.613***	(0.187)	0.069	(0.121)
Q_{75}	1.090***	(0.021)	1.098***	(0.018)	-0.589***	(0.225)	-0.050	(0.133)
Q_{85}	1.115***	(0.022)	1.141***	(0.018)	-0.558*	(0.287)	-0.203	(0.158)
Q_{95}	1.167***	(0.023)	1.226***	(0.023)	-0.496	(0.431)	-0.506**	(0.199)
location	1.045***	(0.004)	1.025***	(0.019)	-0.641***	(0.165)	0.208*	(0.113)
scale	0.054***	(0.004)	0.084***	(0.006)	0.061	(0.161)	-0.300***	(0.048)

Source: Authors' calculations

Note: Bootstrapped standard errors given in parentheses (1,000 replications).

The analysis was also conducted including the separate period when the market experienced turbulence (2018–2021), as well as the period outside this interval (Table A5 in the Appendix). Results showed slight under-shifting in the period 2018–2021 compared to other time intervals, specifically in the lower quantiles.

Graph A1 in the Appendix shows that the quantile coefficient is outside the OLS confidence interval and that there are significant differences between the quantile and

OLS coefficients (in cases when the variable is significant in the scale function (Table 4) its coefficients vary across quantiles). The test of equality of slope estimates across various quantiles is given in table A6 in the Appendix.

Discussion and Conclusion

The tobacco industry uses a variety of pricing strategies and employs different tactics to balance their business and profits. These tactics are different in relation to market segments of tobacco products, and they balance between volume and price, which enables them to keep generating high profit margins. To understand the overall pricing policies, the main objective of this research was to estimate the extent of the tobacco tax pass-through to smokers in Montenegro.

The analysis of tobacco markets and brands shows that the tobacco industry has mostly common strategies and goals, which are implemented through changed product attributes through various characteristics of the pack, such as colour (for example, to convey a characteristic, such as blue=mild), cigarette stick size, and taste. Seeing the declining trend of the breadth of brands since 2012 (with almost 50 fewer brands in 2022) might lead to the reasonable assumption that the industry is more adept at adapting to market changes by stopping brands that duplicate strategies or occasionally introducing new ones or reintroducing brands that had previously exited the market.

Importantly, a key enduring characteristic of the tobacco market in Montenegro is cigarettes' low prices, with the average price of the most-sold brand remaining in the range of 2.3 to 2.7 euros over the past five years. Using the quantile regression to estimate the rate of tax pass-through, it is found that under-shifting is present in the lower quantiles—that is, the group of the cheaper and most-sold products. As expected, slim cigarettes on average have lower prices and are, therefore, more affordable compared to many other types of cigarettes. Nevertheless, the tobacco industry generates enormous profits, compensating the under-shifting with high sales volumes and transferring some of the costs of paying more excise tax to the more expensive brands. The magnitude of the over-shifting is greater at the higher quantiles,

starting nearly from the middle quantile or the median of the price distribution (prices of brands higher than the price of the most-sold brand).

Similar results are obtained by the regression conducted by market segments. In the mid-price tier there is almost full pass-through, while in the premium tier the industry over-shifts the taxes. In contrast, the under-shifting of taxes is found in the economy segment. Estimates suggest that slim cigarettes are cheaper compared to other cigarette types and that their prices are not increased beyond the tax increase.

The tobacco industry does not significantly change the price of its cheapest products and/or the most-sold ones, but instead transfers the costs to the premium and most expensive brands. Going beyond just the segments to consider the cigarette brands' characteristics, it is evident that the industry focus is on females (both adult and young), who mostly consume slim cigarettes (Carpenter et al., 2005; Moodie et al., 2015). For instance, according to empirical evidence from Montenegro (Survey on Tobacco Consumption in Montenegro, or STC-MNE 2022), 84.8 percent of smokers who consume only slims are females. The share of these products is increasing in the Montenegrin market, which is likely why tobacco companies keep these cigarettes affordable. Thus, strategies to maintain a stable market share of the cheaper products include keeping them affordable and making them more attractive to consumers through low prices and focusing marketing on females and girls as vulnerable group (Cevik, 2018; Wang et al., 2015; Wilson et al., 2021a).

One major advantage of our analysis is the use of quantile regression, by which different pass-through aspects can be analyzed at certain points in the entire price distribution (comprehensive market segmentation). This is important in the context of analyzing the pricing strategies' impacts on the lowest and highest quantiles (prices). Moreover, another strength of the analysis is the regression done by market tiers economy, mid-price, and premium by which the consistency of the results is confirmed, as both approaches generated similar results.

A limitation of the analysis is seen in the lack of availability of a longer time series of data, as well as more detailed information about the brands' characteristics. This issue was a preventing factor in analyzing the impacts of different cigarettes' attributes on

prices and pass-through of taxes much beyond slims. Also, future research should potentially be extended to estimating price and cross-price elasticities across market tiers. These results suggest that consumers potentially react differently to the price increase by segments.

One of the most effective tools is to significantly increase excise taxes, as prices remain very low by regional standards. Recent changes in excise taxes have been applied semi-annually, but instead of this gradual approach there is a need for accelerated change with greater increases of taxes each time. In that manner, it is possible to maximize the benefit to public health and broader public finances from a policy of significantly higher taxation on tobacco. To complement taxation, the Government of Montenegro should also strongly consider policies that address the use of cigarette characteristics and/or their presentation. The Government should consider banning flavored cigarettes like menthols, colors on packages, and misleading brand descriptors such as “light” or “low.” The country needs to amend the current legislation to introduce plain/standardized packaging (Article 11, WHO FCTC), as the existing evidence shows that removal of descriptors is replaced by the variety of colors, which often leads to misperceptions about smoking’s adverse effects because lighter colors are associated with safety and healthier products (Bansal-Travers et al., 2011; Lempert & Glantz, 2017). Instead, cigarette packaging should be made more visually unappealing.

References

Adrison, V., & Putranto, W. (2018). Firms' performance under a different cigarette tax system: Empirical evidence from indonesian cigarette manufacturing firms. *International Journal of Economics and Management*, *12*(1), 83–98.

Ally, A. K., Meng, Y., Chakraborty, R., Dobson, P. W., Seaton, J. S., Holmes, J., Angus, C., Guo, Y., Hill-McManus, D., Brennan, A., & Meier, P. S. (2014). Alcohol tax pass-through across the product and price range: Do retailers treat cheap alcohol differently?: Alcohol tax pass-through across the product and price range. *Addiction*, *109*(12), 1994–2002. https://doi.org/10.1111/add.12590

Apollonio, D. E., & Glantz, S. A. (2020). *Tobacco industry promotions and pricing after tax increases: An analysis of internal industry documents*. *22*(6).

Bansal-Travers, M., O'Connor, R., Fix, B. V., & Cummings, K. M. (2011). What do cigarette pack colors communicate to smokers in the U.S.? *American Journal of Preventive Medicine*, *40*(6), 683–689. https://doi.org/10.1016/j.amepre.2011.01.019

Carpenter, C. M., Wayne, G. F., & Connolly, G. N. (2005). Designing cigarettes for women: New findings from the tobacco industry documents. *Addiction (Abingdon, England)*, *100*(6), 837–851. https://doi.org/10.1111/j.1360-0443.2005.01072.x

Cevik, S. (2018). Smoke screen: Estimating the tax pass-through to cigarette prices in Pakistan. *Review of Development Economics*, *22*(3), e1–e15. https://doi.org/10.1111/rode.12514

Gilmore, A. B., Tavakoly, B., Taylor, G., & Reed, H. (2013). Understanding tobacco industry pricing strategy and whether it undermines tobacco tax policy: The example of the UK cigarette market. *Addiction*, *108*(7), 1317–1326. https://doi.org/10.1111/add.12159

Juárez, B. S. de M., Thrasher, J. F., Shigematsu, L. M. R., Ávila, M. H., & Chaloupka, F. J. (2014). Tax, price and cigarette brand preferences: A longitudinal study of adult smokers from the ITC Mexico Survey. *Tobacco Control*, *23*(suppl 1), i80–i85. https://doi.org/10.1136/tobaccocontrol-2012-050939

Lempert, L. K., & Glantz, S. (2017). Packaging colour research by tobacco companies: The pack as a product characteristic. *Tobacco Control*, *26*(3), 307–315. https://doi.org/10.1136/tobaccocontrol-2015-052656

Linegar, D. J., & van Walbeek, C. (2018). The effect of excise tax increases on cigarette prices in South Africa. *Tobacco Control*, *27*(1), 65–71. https://doi.org/10.1136/tobaccocontrol-2016-053340

Marsh, L., Cameron, C., Quigg, R., Hoek, J., Doscher, C., McGee, R., & Sullivan, T. (2016). The impact of an increase in excise tax on the retail price of tobacco in New Zealand. *Tobacco Control*, *25*(4), 458–463. https://doi.org/10.1136/tobaccocontrol-2015-052259

Moodie, C., Ford, A., Mackintosh, A., & Purves, R. (2015). Are all cigarettes just the same? Female's perceptions of slim, coloured, aromatized and capsule cigarettes. *Health Education Research*, *30*(1), 1–12. https://doi.org/10.1093/her/cyu063

Mugoša, A., Laković, T., Kovačević, M., Čizmović, M., & Popović, M. (2020). *Adult tobacco use in Montenegro.* Podgorica, Montenegro: The Institute of Socioeconomic Analysis. https://tobacconomics.org/research/adult-tobacco-use-in-montenegro-report/

Prasetyo, B. W., & Adrison, V. (2019). Cigarette prices in a complex cigarette tax system: Empirical evidence from Indonesia. *Tobacco Control*, 29(6), 618-623 . https://doi.org/10.1136/tobaccocontrol-2018-054872

Shirane, R., Smith, K., Ross, H., Silver, K. E., Williams, S., & Gilmore, A. (2012). Tobacco industry manipulation of tobacco excise and tobacco advertising policies in the Czech Republic: An analysis of tobacco industry documents. *PLoS Medicine*, *9*(6), e1001248. https://doi.org/10.1371/journal.pmed.1001248

Tauras, J. A., Peck, R. M., & Chaloupka, F. J. (2006). The role of retail prices and promotions in determining cigarette brand market shares. *Review of Industrial Organization*, *28*(3), 253–284.

Tobacconomics. (2023). *The illicit cigarette market in Montenegro*. A Tobacconomics Research Report. Tobacconomics, Health Policy Center, Institute for Health Research and Policy, University of Illinois Chicago. https://tobacconomics.org/files/research/846/montenegro-illicit-trade-report-v3.0.pdf

Trenda, E. (2023). *Retail price of cigarettes in Europe 2022, by country*. https://www.statista.com/statistics/415034/cigarette-prices-across-europe/

Wang, X., Zheng, Y., Reed, M., & Zhen, C. (2015). *Cigarette tax pass-through by product characteristics: Evidence from Nielsen retail scanner data*. https://ssrn.com/abstract=2686274

Wang, Y., Lewis, M., & Singh, V. (2021). Investigating the effects of excise taxes, public usage restrictions, and antismoking ads across cigarette brands. *Journal of Marketing*, *85*(3), 150–167. https://doi.org/10.1177/0022242921994566

Wilson, L. B., Pryce, R., Hiscock, R., Angus, C., Brennan, A., & Gillespie, D. (2021a). Quantile regression of tobacco tax pass-through in the UK 2013–2019. How have manufacturers passed through tax changes for different tobacco products? *Tobacco Control*, *30*(e1), e27–e32. https://doi.org/10.1136/tobaccocontrol-2020-055931

Appendix

Table A1. Prices of cigarette brands in real terms, 2010–2022

Year	The most-sold brand	Price (euro)	Premium brand	Price (euro)	Cheapest brand	Price (euro)
2022	Winston XStyle long blue	2.3	Marlboro	3.1	Fast revolution 8	1.9
2021	Winston XStyle long blue	2.4	Marlboro	3.3	Una slims gold	2.0
2020	Winston XStyle long blue	2.4	Marlboro	3.3	LD Club compact blue	2.0
2019	Winston XStyle long blue	2.3	Marlboro	3.4	LD red	1.8
2018	Winston XStyle long blue	2.2	Marlboro	3.3	Code red	1.6
2017	L&M loft blue	2.0	Marlboro	2.9	Negro	1.0
2016	L&M loft blue	1.8	Marlboro	2.7	Negro	1.0
2015	Ronhill wave black	1.6	Marlboro	2.6	Negro	1.0
2014	Ronhill wave black	1.5	Marlboro	2.5	York YLB hard pack	1.0
2013	Code blue	1.3	Marlboro	2.3	York YLB hard pack	1.0
2012	Drina denifine	1.2	Marlboro	2.1	Monte crni	0.7
2011	Drina denifine	1.0	Marlboro	1.9	Monte crni	0.5
2010	Drina denifine	0.7	Marlboro	1.7	Cuba	0.4

Source: Authors' calculations

Table A2. Quantiles of price paid per pack and quantity sold, 2010–2022

Year	Price (euro)		CI	Quantity (millions)	Share
2022					
< Q25	2.32		(2.31 - 2.33)	13.3	27%
Q50	2.63		(2.62 - 2.64)	20.6	43%
Q75	2.94		(2.91 - 2.97)	8.8	18%
> Q75	3.68		(3.64 - 3.72)	5.7	12%
2021					

< Q25	2.12		(2.11 - 2.13)	8.8	22%
Q50	2.45		(2.44 - 2.46)	15.2	38%
Q75	2.64		(2.63 - 2.64)	8.8	22%
> Q75	3.45		(3.41 - 3.48)	6.8	17%
2020					
< Q25	2.11		(2.10 - 2.11)	6.4	21%
Q50	2.41		(2.40 - 2.41)	16.7	55%
Q75	2.72		(2.70 - 2.73)	1.9	6%
> Q75	3.34		(3.31 - 3.37)	5.6	18%
2019					
< Q25	2.21		(2.19 - 2.22)	11.7	33%
Q50	2.46		(2.45 - 2.46)	9.3	27%
Q75	2.71		(2.70 - 2.72)	6.9	20%
> Q75	3.54		(3.51 - 3.56)	7.1	20%
2018					
< Q25	2.04		(2.03 - 2.04)	3.5	14%
Q50	2.31		(2.30 - 2.32)	10.9	42%
Q75	2.60		(2.59 - 2.61)	4.6	17%
> Q75	3.28		(3.25 - 3.31)	7.1	27%
2017					
< Q25	1.72		(1.71 - 1.73)	9.6	22%
Q50	1.94		(1.94 - 1.95)	10.0	23%
Q75	2.18		(2.17 - 2.19)	13.4	30%
> Q75	2.84		(2.81 - 2.87)	11.3	26%
2016					
< Q25	1.56		(1.55 - 1.56)	9.3	21%
Q50	1.74		(1.74 - 1.75)	15.4	34%
Q75	1.96		(1.95 - 1.96)	10.4	23%
> Q75	2.57		(2.54 - 2.59)	9.8	22%
2015					
< Q25	1.46		(1.46 - 1.47)	11.8	27%
Q50	1.66		(1.65 - 1.66)	11.4	26%
Q75	1.85		(1.84 - 1.85)	9.4	21%
> Q75	2.42		(2.39 - 2.45)	11.3	26%
2014					

< Q25	1.31		(1.30 - 1.32)	13.6	32%
Q50	1.53		(1.52 - 1.53)	6.6	15%
Q75	1.73		(1.73 - 1.73)	10.7	25%
> Q75	2.28		(2.26 - 2.31)	11.8	28%
	2013				
< Q25	1.19		(1.18 - 1.20)	20.5	40%
Q50	1.47		(1.46 - 1.47)	10.2	20%
Q75	1.72		(1.71 - 1.72)	10.2	20%
> Q75	2.23		(2.22 - 2.25)	9.9	20%
	2012				
< Q25	1.07		(1.06 - 1.08)	24.6	45%
Q50	1.42		(1.41 - 1.43)	14.5	27%
Q75	1.69		(1.68 - 1.69)	4.7	9%
> Q75	2.12		(2.10 - 2.14)	10.5	19%
	2011				
< Q25	0.85		(0.84 - 0.87)	35.0	48%
Q50	1.15		(1.14 - 1.16)	10.5	14%
Q75	1.47		(1.46 - 1.47)	14.3	20%
> Q75	1.97		(1.94 - 1.99)	13.2	18%
	2010				
< Q25	0.67		(0.66 - 0.68)	44.8	54%
Q50	1.12		(1.11 - 1.13)	17.2	21%
Q75	1.30		(1.30 - 1.30)	9.7	12%
> Q75	1.77		(1.75 - 1.79)	11.8	14%

Source: Authors' calculations

Note: The data are divided by three quantiles (four quantile bands) to present the average price and shares on a more aggregated level compared the one used in the regression.

Table A3a. Shares of slim cigarettes sold by segments, 2010–2022

		Slim cigarettes		
		Economy	Mid-price	Premium
2010	%	31.85	21.19	18.69
	CI	(24.23 - 39.47)	(16.61 - 25.77)	(14.12 - 23.25)
2011	%	34.91	30.56	4.73
	CI	(27.61 - 42.21)	(25.83 - 35.29)	(2.78 - 6.68)
2012	%	21.21	28.47	4.67
	CI	(15.95 - 26.48)	(23.94 - 33.00)	(2.82 - 6.53)
2013	%	18.17	29.86	4.74
	CI	(13.38 - 22.97)	(25.07 - 34.66)	(2.93 - 6.55)
2014	%	23.85	30.03	4.75
	CI	(18.09 - 29.62)	(25.09 - 34.97)	(3.12 - 6.38)
2015	%	18.06	33.63	6.34
	CI	(13.13 - 22.99)	(27.06 - 40.19)	(4.40 - 8.27)
2016	%	16.94	34.12	3.35
	CI	(11.66 - 22.21)	(28.20 - 40.05)	(2.19 - 4.50)
2017	%	23.52	34.10	4.78
	CI	(16.58 - 30.46)	(28.91 - 39.29)	(3.09 - 6.47)
2018	%	38.63	37.88	6.05
	CI	(27.41 - 49.85)	(31.27 - 44.48)	(3.54 - 8.56)
2019	%	37.06	32.08	16.66
	CI	(25.99 - 48.13)	(24.87 - 39.28)	(12.15 - 21.18)
2020	%	46.40	32.38	5.16
	CI	(36.03 - 56.77)	(23.87 - 40.88)	(3.45 - 6.87)
2021	%	53.55	30.67	5.38
	CI	(42.10 - 65.00)	(22.38 - 38.97)	(3.48 - 7.28)
2022	%	54.08	29.08	2.28
	CI	(42.01 - 66.16)	(20.57 - 37.58)	(1.32 - 3.24)

Source: Authors' calculations

Note: Percentages are given within segments.

Table A3b. Shares of slim cigarettes sold by quantiles, 2010–2022

	Slim cigarettes	
Quantiles	Percent	CI
≤ Q_5	26.15	(21.97 - 30.34)
Q_5 - Q_{15}	19.27	(16.65 - 21.88)
Q_{15} - Q_{25}	25.59	(23.35 - 27.83)
Q_{25} - Q_{35}	13.08	(8.36 - 17.79)
Q_{35} - Q_{45}	28.57	(25.70 - 31.44)
Q_{45} - Q_{50}	27.33	(22.27 - 32.38)
Q_{50} - Q_{55}	16.26	(13.06 - 19.47)
Q_{55} - Q_{65}	25.68	(21.55 - 29.80)
Q_{65} - Q_{75}	32.01	(28.45 - 35.56)
Q_{75} - Q_{85}	22.67	(17.25 - 28.10)
Q_{85} - Q_{95}	8.74	(7.01 - 10.46)
≥ Q_{95}	5.31	(4.08 - 6.53)

Source: Authors' calculations

Note: The data are divided by 11 quantiles (12 quantile bands) and given within quantile bands.

Table A4a. Number of new brands entering the market by year, tiers, and brand variants

	Economy	**Middle**	**Premium**	**Slims**
2011	10	0	7	0
2012	6	5	8	5
2013	2	12	4	4
2014	2	12	4	4
2015	14	5	2	4
2016	3	3	3	1
2017	5	6	4	7
2018	5	5	2	6
2019	8	2	0	2
2020	2	0	0	2
2021	9	13	1	7
2022	0	2	3	0
Total	**66**	**65**	**38**	**42**

Source: Authors' calculations

Table A4b. Number of brands exiting the market by year, tiers, and brand variants

	Economy	Middle	Premium	Slims
2010	0	4	1	2
2011	4	4	2	1
2012	11	3	3	1
2013	7	14	9	4
2014	8	4	1	7
2015	16	3	2	4
2016	10	4	3	3
2017	9	5	3	1
2018	5	8	4	5
2019	10	17	3	9
2020	2	4	3	2
2021	16	4	3	10
Total	**98**	**74**	**37**	**49**

Source: Authors' calculations

Graph A1. Quantile regression of expected price coefficients

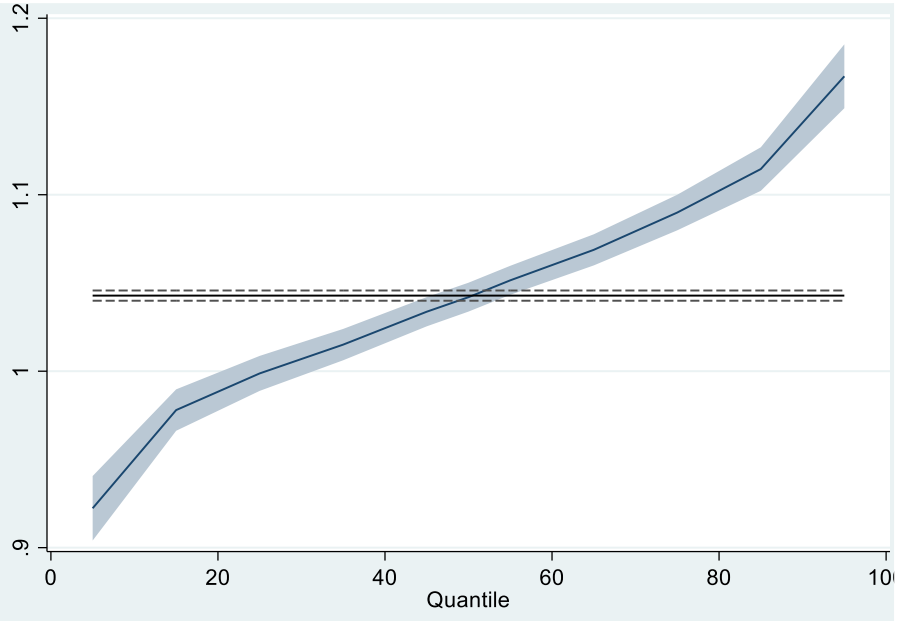


Table A5. Pass-through of taxes by quantile regression, encompassing two different time intervals

	Year (2018–2021)		Year (2010–2017, 2022)	
Quantiles	Expected price (euro)	St. dev	Expected price (euro)	St. dev
Q_5	0.890***	(0.017)	0.953***	(0.006)
Q_{15}	0.916***	(0.014)	0.973***	(0.004)
Q_{25}	0.946***	(0.011)	0.982***	(0.003)
Q_{35}	0.955***	(0.010)	0.990***	(0.003)
Q_{45}	0.971***	(0.009)	0.999***	(0.004)
Q_{50}	0.977***	(0.009)	1.004***	(0.004)
Q_{55}	0.992***	(0.008)	1.010***	(0.005)
Q_{65}	1.006***	(0.008)	1.022***	(0.006)
Q_{75}	1.011***	(0.008)	1.032***	(0.008)
Q_{85}	1.018***	(0.008)	1.042***	(0.009)
Q_{95}	1.040***	(0.010)	1.064***	(0.012)
location	0.973***	(0.009)	1.007***	(0.005)
scale	0.041***	(0.006)	0.028***	(0.004)

Source: Authors' calculations

Note: Bootstrapped standard errors given in parenthesis (1,000 replications).

Table A6. Test of equality of slope estimates across various quantiles

	Model 1		Model 2	
Quantile	chi2(1)	p-value	chi2(1)	p-value
5 versus 15	177.82	0.00	47.23	0.00
15 versus 25	203.3	0.00	47.17	0.00
25 versus 35	212.33	0.00	47.35	0.00
35 versus 45	210.25	0.00	47.45	0.00
45 versus 50	172.19	0.00	45.26	0.00
50 versus 55	185.42	0.00	46.24	0.00
55 versus 65	199.98	0.00	47.16	0.00
65 versus 75	209.68	0.00	47.68	0.00
75 versus 85	195	0.00	47.35	0.00
85 versus 95	201.09	0.00	47.93	0.00

Source: Authors' calculations