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Effects of tobacco taxation on smoking prevalence in Poland

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Abstract

This report studies the health and economic aspects of tobacco taxation in Poland, including an assessment of the expected impact of excise hikes implemented by the Polish government from March 2025 on smoking incidence and cigarette consumption. We provide a detailed analysis of demand elasticities for cigarettes, examining the effects of price and income changes on the smoking behaviour of households. We find that a 10% increase in the ratio of cigarette price to income leads to a 0.47 percentage point decrease in the probability of households buying cigarettes, or 1.8% fewer smokers. This effect is more pronounced among less educated groups. The overall cigarette consumption decreases by 4.3% in response to a 10% increase in cigarette prices relative to income. Since 2014, cigarette affordability in Poland has steadily increased, with the average wage in 2024 enabling the purchase of 54% more cigarettes than a decade earlier as incomes have risen faster than prices. In October 2024, the new excise roadmap was adopted to return cigarette affordability by 2027 to the 2021 levels. We compare smoking prevalence projections under this accelerated scenario with those based on the previous excise tax plan. Our estimates suggest that the accelerated excise increases will reduce overall cigarette consumption by 7.3%, decrease the number of adult smokers by approximately 247,000, and prevent at least 74,000 premature deaths.

Keywords: Excise, Tobacco, Smoking

JEL classification: H24, I18

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Executive summary

This report studies the health and economic aspects of tobacco taxation in Poland, including an assessment of the expected impact of excise hikes implemented by the Polish government from March 2025 on smoking incidence and cigarette consumption. As of 2019, 24.3% of adult Poles were smokers, with 20.9% smoking daily. The prevalence varied substantially by education level, with higher rates among those without tertiary education. Despite a general decline in smoking rates since 2014, there has been an increase among individuals without tertiary (college) education. We show that while the overall smoking prevalence in Poland is slightly below the EU average, the number of cigarettes consumed per smoker is higher in Poland.

The tobacco industry in Poland, comprising major international companies like Philip Morris and Japan Tobacco International, primarily serves export markets, with 90% of production directed abroad. The industry's contribution to the Polish economy is modest, accounting for less than 1% of total manufacturing value added as of 2022. Its contribution to employment is even lower, amounting to 0.3% of total employment in manufacturing, equivalent to 0.06% of total employment. Furthermore, the industry's contribution to corporate tax revenues is relatively low, with Philip Morris being the notable exception.

To evaluate the expected impact of excise hikes on smoking prevalence and cigarette consumption, we first estimate price demand elasticities for cigarettes, accounting for income changes at the household level. We find that a 10% increase in the ratio of cigarette price to income reduces the probability that households will buy cigarettes by 0.47 percentage points, translating to 1.8% fewer smokers. This effect is more pronounced among less educated groups. Among households that continue to smoke, such a 10% increase in the relative price of cigarettes reduces the quantity of cigarettes bought by 2.8%. In consequence, a 10% increase in the cigarette price relative to income reduces overall cigarette consumption by 4.3%.

Since 2014, cigarette affordability in Poland has steadily increased as incomes have risen faster than prices, partly because the tobacco excise lags behind inflation. As a result, the average wage in 2024 enabled the purchase of 54% more cigarettes than a decade earlier. In October 2024, the new excise roadmap was adopted, aiming to return cigarette affordability to the 2021 levels by 2027. We compare smoking-prevalence projections under this accelerated scenario with those based on the previous excise tax plan. Our estimates suggest that the accelerated excise hikes will reduce overall cigarette consumption by 7.3%, decrease the number of adult smokers by approximately 247,000, and prevent at least 74,000 premature deaths.

1. Background and descriptive evidence

1.1. SMOKING PREVALENCE IN POLAND

Smoking prevalence data are collected through the European Health Interview Survey (EHIS), which has been conducted in Poland in three waves: 2009, 2014 and 2019. As of 2019, nearly 21% of adult Poles smoked tobacco products daily, excluding electronic cigarettes (Figure 1). This is just below the EU average (21.1%) and very close to the peer Central and Eastern European (CEE) countries, such as Czechia, Lithuania and Romania. With occasional smokers included, smoking prevalence in Poland amounted to 24.3%, compared to 26.0% in the EU. Smoking is less common among younger Poles, with 18.5% of individuals aged 18-39 smoking daily, compared to the EU average of 22.1% (Figure 2). However, as of 2019, Poland had the highest percentage of electronic cigarette users in the EU, with 4% of the adult population using them (Figure 3).

Figure 1 / Smoking prevalence in population aged 18-79, 2019

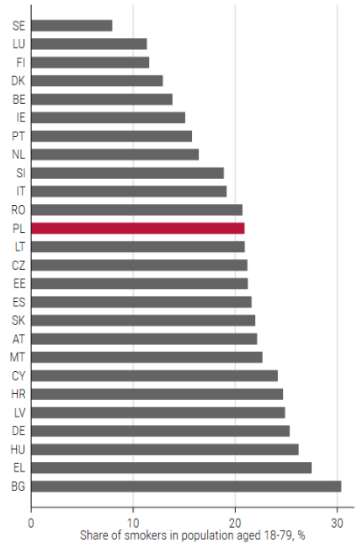


Figure 2 / Smoking prevalence in population aged 18-39, 2019

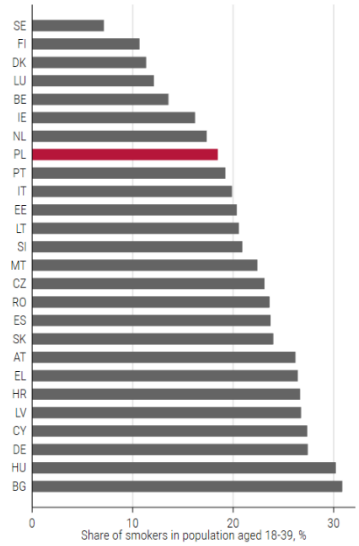
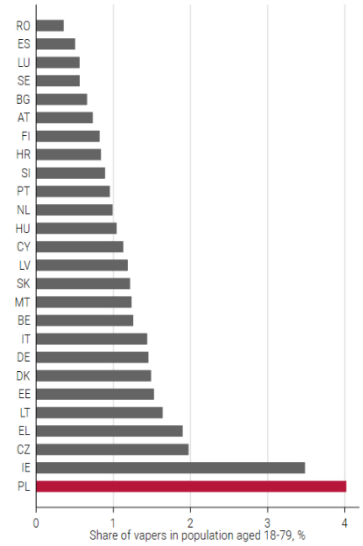


Figure 3 / Vaping prevalence in population aged 18-79, 2019



Source: own depiction based on EHIS data

The share of daily smokers in Poland in 2019 (20.9%) was significantly lower than in 2014 (24.3%). A similar decline in smoking prevalence was also observed in other CEE countries. However, the dynamics of smoking prevalence vary according to education level. Among the population without tertiary education, the share of daily smokers in 2019 (25.1%) was slightly higher than in 2009 (24.5%; Figure 4). In contrast, the share of daily smokers among the population with tertiary education was only 9.0% in 2019, compared to 14.0% in 2009 (Figure 5). Such a downward trend among better-educated people was common in most CEE countries.

Figure 4 / Trends in smoking prevalence, population 18-79, without tertiary education

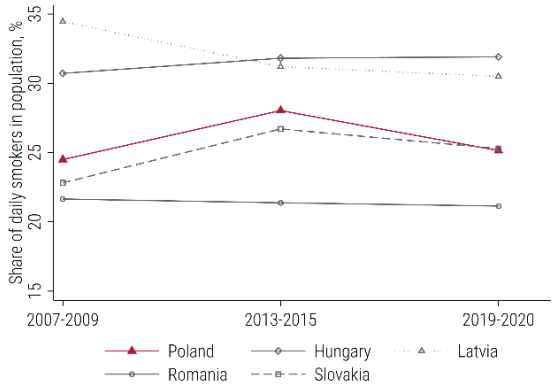
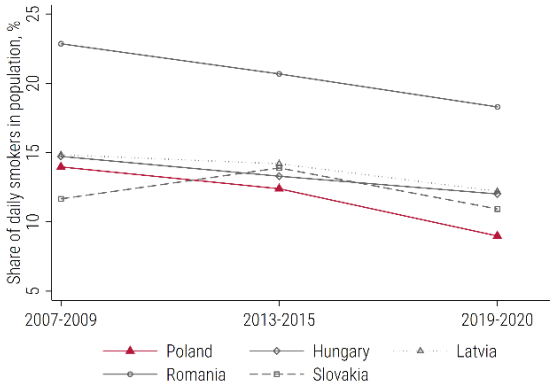


Figure 5 / Trends in smoking prevalence, population 18-79, tertiary-educated



Source: own depiction based on EHIS data

The Polish Household Budget Survey (HBS) allows us to look at more recent data for Poland. With this dataset, rather than identifying individual smokers, we can calculate the share of households with cigarette expenditures. In 2019, this share of households, derived from the HBS data, amounted to 28.1% compared to 24.3% of individual smokers, according to EHIS data. The difference arises from the fact that some households include both smokers and non-smokers. In the pandemic year of 2020, the share of households with cigarette expenditures dropped by 1.9 percentage points (pps), to 26.2%, but it increased in the next two years, reaching 27.9% in 2022. Regarding long-term trends, the share of households with smokers steadily decreased from 2010 to 2015 among young and middle-aged households (Figure 6) as well as among all educational groups (Figure 7). In contrast, since 2016, there has been a steady rise in the share of households with smokers, except among households with tertiary-educated members (Figure 7).

Figure 6 / Trends in smoking prevalence by age of the head of the household

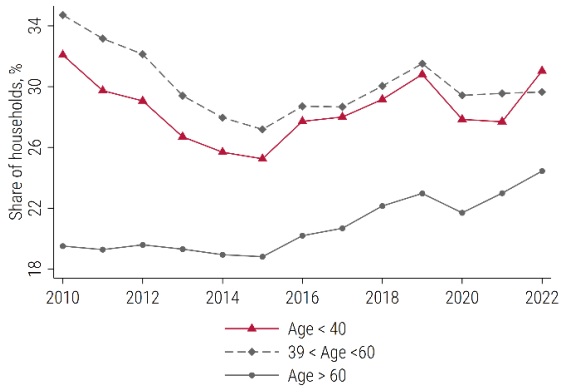
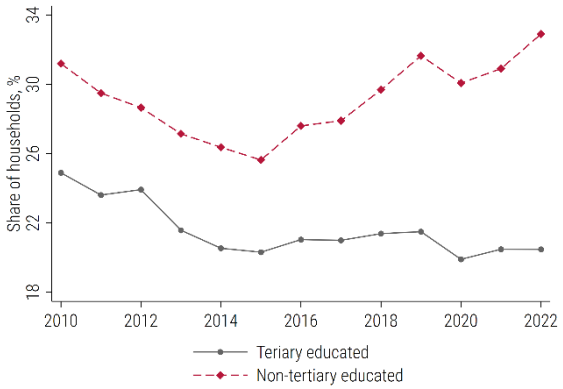


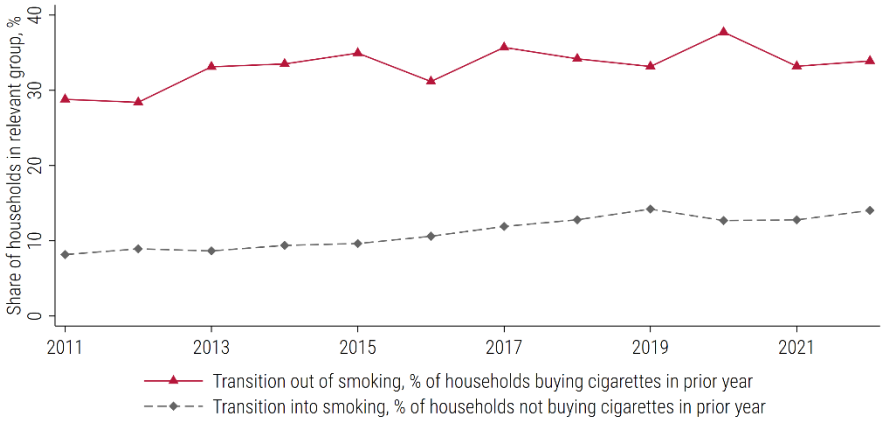
Figure 7 / Trends in smoking prevalence by highest educational attainment in the household



Source: own depiction based on the HBS, Statistics Poland

The smoking status of households became less stable in the late 2010s. Of households with no recorded expenditure on cigarettes in 2010, 8.2% bought cigarettes in 2011 (Figure 8). This rate steadily increased, reaching 14.2% in 2019. However, the rate of households that ceased buying cigarettes also increased over time, albeit in a less consistent manner. In 2020, 37.7% of households that had purchased cigarettes the previous year stopped doing so. This spike can be attributed to health concerns during the COVID-19 pandemic, with smokers being more likely to experience severe illness.

Figure 8 / Changes in the smoking status



Source: own depiction based on the HBS

Figure 9 / Mean number of daily cigarettes per smoker, population aged 18-79, 2019

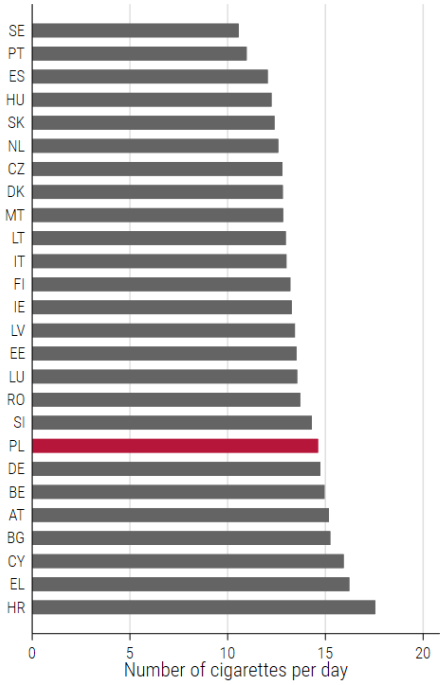
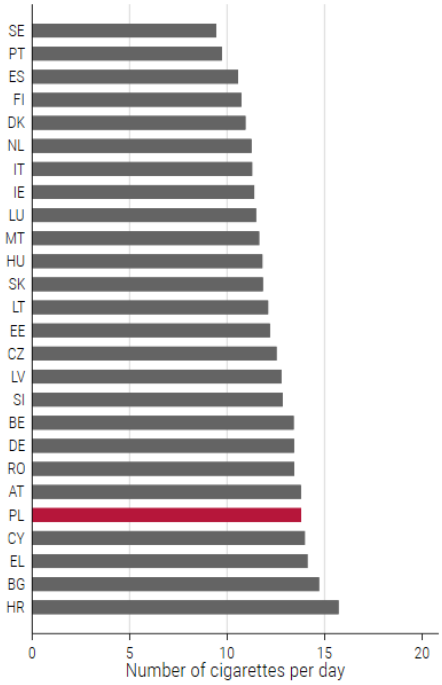


Figure 10 / Mean number of daily cigarettes per smoker, population aged 18-39, 2019

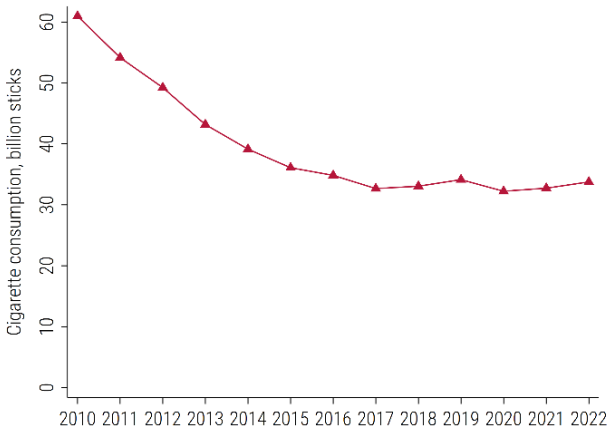


Source: own depiction based on EHIS data

Although the share of daily smokers in Poland is below the EU average, the average number of cigarettes per smoker is higher in Poland than in the EU. For the population aged 18-79, the average in Poland is 14.6 cigarettes per day, compared to 13.8 in the EU (Figure 9). In neighbouring CEE countries, it is even lower, not exceeding 13 cigarettes per day. Looking at the younger part of the population, Polish smokers diverge from the EU average even more (Figure 10). Among these younger smokers, the average number of daily cigarettes equals 13.8, compared with 12.5 in the EU.

According to the HBS, total cigarette consumption declined significantly between 2010 and 2017 (Figure 11). In 2010, annual consumption exceeded 60 billion sticks, dropping to 32.7 billion sticks by 2017. Afterwards, consumption fluctuated, with slight increases in 2018 and 2019, followed by a decrease during the pandemic. In 2022, it rose by a billion sticks, reaching 33.8 billion.

Figure 11 / Total consumption of cigarettes in Poland, 2010-2022



Source: own depiction based on the HBS, Statistics Poland

1.2. THE ROLE OF THE TOBACCO INDUSTRY IN THE POLISH ECONOMY

Poland hosts four large international tobacco producers: Philip Morris, Japan Tobacco International, British American Tobacco and Imperial Tobacco. Their production is mainly export-oriented; as of 2020, 90.5% of tobacco production was directed towards exports.[1] Most of those exports constituted intra-EU trade. Therefore, this industry is not closely dependent on Polish consumers. Rather, its growth depends on the EU-wide demand for tobacco products.

The tobacco industry makes a rather modest contribution to the Polish economy. At its peak, it generated 1.4% of the value added of total manufacturing (Figure 12). However, since 2020, the output of this industry has been contracting annually by around 3% in real terms. This stands in contrast to other branches of manufacturing, which grew rapidly in 2021 and 2022. In effect, the share of the tobacco industry in total manufacturing amounted to less than 0.9% in 2022.

The share of the tobacco industry in total manufacturing exports is even lower, at just above 0.4% in 2022 (Figure 13). The quantity of cigarettes exported recorded a one-time significant increase in 2017

[1] Based on the most recent input-output table at basic prices for the Polish economy.

(from 140,000 to 170,000 tonnes) and has become more volatile since the pandemic year of 2020 (Figure 14). Germany is a top destination, absorbing 45% of Polish exports, followed by Spain and Italy (Figure 15). Interestingly, over 3% of exports are directed to Saudi Arabia. In comparison to exports, the quantities of tobacco products imported are negligible, amounting to 3,500 tonnes in 2023.

Figure 12 / The contribution of tobacco industry to the value added of Polish manufacturing

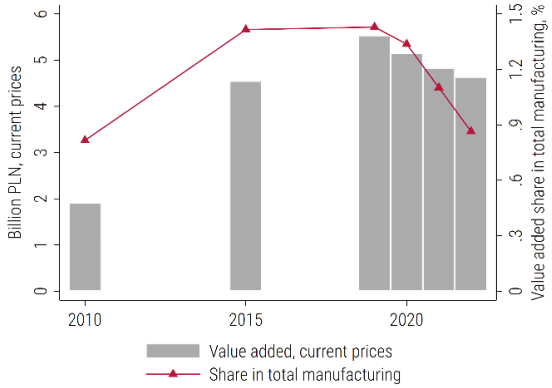
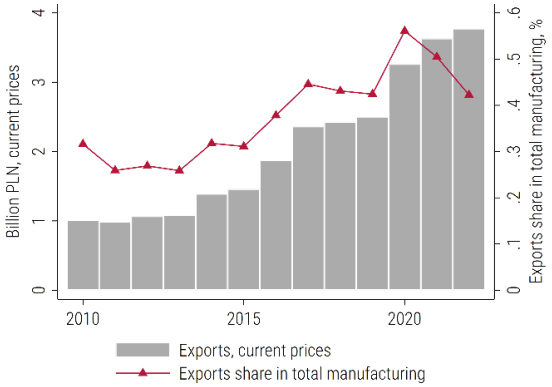


Figure 13 / The contribution of tobacco industry to the exports of Polish manufacturing



Note: Due to large data revisions, there is no credible information on the value added of the tobacco industry in the 2011-2014 and 2016-2018 periods.
Source: own depiction based on the Statistics Poland data

Figure 14 / Exports of tobacco products in thousand tonnes and in current USD values

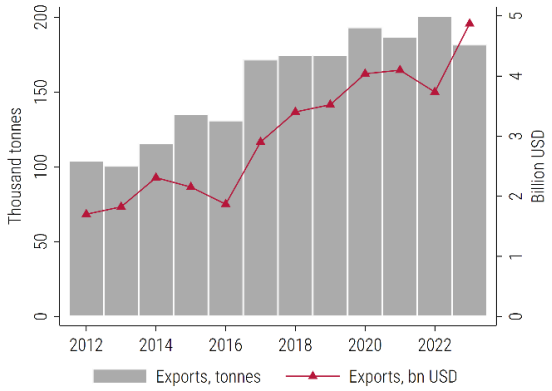
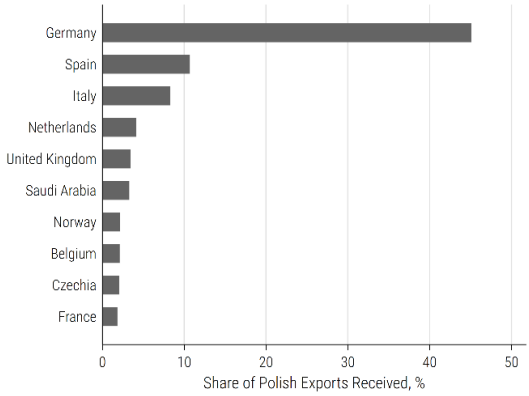


Figure 15 / Destination structure of Polish exports of tobacco products, 2023



Source: own depiction based on UN Comtrade data

The employment share of the tobacco industry in total manufacturing is lower than its share in value added. As of 2022, tobacco-industry employment amounted to 8,000 full-time equivalents (8,400 employees), making up 0.3% of employment in total manufacturing and 0.06% of overall employment in Poland (Figure 16). Despite a moderate decline in production, the employment remained at the 2019 level.

Wages in the tobacco industry are significantly higher than the average wages in manufacturing (Figure 17). Although this ratio declined over the last decade, in 2022, the average wage in the tobacco industry was equal to 150% of the average wage in manufacturing. That same year saw a large increase in nominal wages (by nearly 15%) and relative to the average wages in manufacturing (by 4 pps). In Poland, foreign-owned companies typically pay higher wages than domestic producers, and this is apparently also the case in the tobacco industry, which is dominated by foreign-owned firms.

Figure 16 / Employment in the tobacco industry

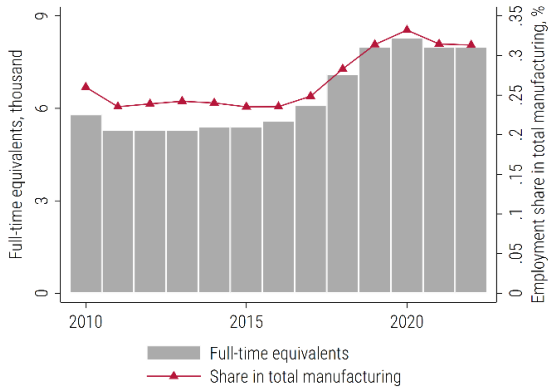
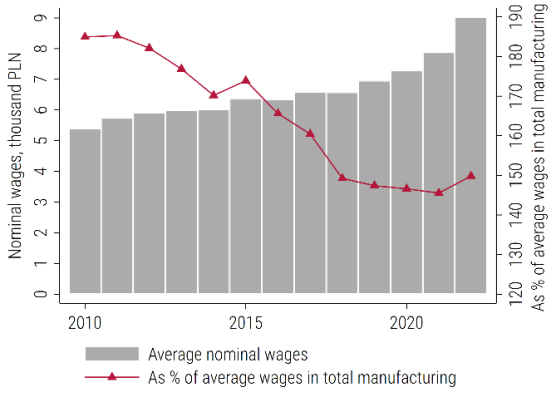


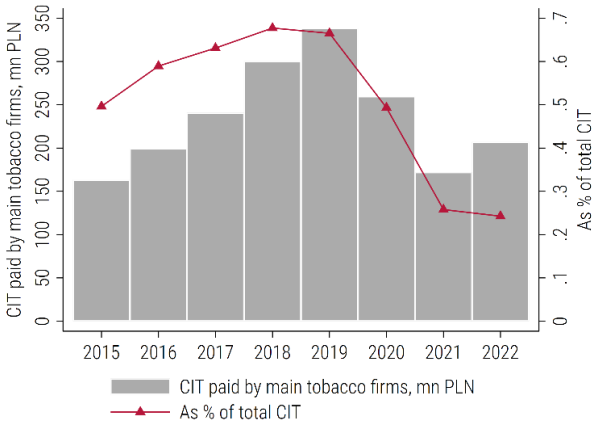
Figure 17 / Wages in the tobacco industry



Source: own depiction based on Statistics Poland data

The tobacco industry is not a major payer of corporate taxes. In the 2016-2019 period, the corporate income tax (CIT) paid by the four international tobacco companies operating in Poland grew systematically, reaching PLN 338 million in 2019, which made up 0.67% of total CIT revenues (Figure 18). Subsequently, as the value added of the industry decreased, the nominal CIT payments decreased substantially. In 2022, they represented only 0.24% of Poland's total CIT.

Figure 18 / Corporate income tax paid by the main tobacco companies



Source: own depiction based on Polish Ministry of Finance data

The Philip Morris group accounted for the majority of these CIT payments (Figure A1 in the Appendix). While it is the group with the largest revenues, it also pays a proportionately higher amount of its turnover as CIT tax. The lowest taxes are paid by the British American Tobacco group, with the largest payment amounting to just PLN 22 million (out of PLN 8.9 billion revenue in 2022; Figure A3 in the Appendix). The Japan Tobacco International group has expanded its activity in recent years, with revenues growing from PLN 4.6 billion in 2015 to PLN 12.1 billion in 2022 (Figure A2). Nevertheless, its CIT payments remain limited, reaching only PLN 42 million in 2022. The CIT paid by Imperial Tobacco is, on average, higher than the taxes contributed by Japan Tobacco International or British American Tobacco (Figure A4 in the Appendix). Overall, the multinational cigarette producers do not pay significant taxes on their income in Poland, with the only exception being the Philip Morris group.

1.3. EXCISE ON TOBACCO PRODUCTS IN POLAND

The excise duty on tobacco products is harmonised in the EU, according to the *Council Directive 2011/64/EU of 21 June 2011 on the structure and rates of excise duty applied to manufactured tobacco*. For cigarettes, the directive requires EU member states to apply a combination of a specific component, which is a fixed amount per 1,000 cigarettes, and an ad valorem component, which is a percentage of the retail selling price. The total excise duty on cigarettes must be at least EUR 90 per 1,000 cigarettes and also must represent at least 60% of the weighted average retail selling price (WAP). However, member states that set an excise duty of EUR 115 or more per 1,000 cigarettes are exempt from this 60% rule.

As of 2024, the excise duty in Poland amounts to PLN 276.00 (EUR 64.3) per 1,000 cigarettes, plus 32.05% of the maximum retail price of a given product, which is decided by the producer and printed on the pack. However, the reference retail price cannot be lower than 105% of the average retail market price of cigarettes. This reference value is announced by the Ministry of Finance based on the data from the preceding year. For 2024, it amounts to PLN 815.54 (EUR 190.1) per 1,000 cigarettes. Therefore, the minimum excise tax per 1,000 cigarettes equals PLN 550.45 (EUR 128.3):

$$excise = 276 + 0.3205 \times 1.05 \times 815.54 = 550.45$$

Hence, the excise rates in Poland substantially exceed the minimum values required by the EU. Historically, the excise duty on tobacco was increasing in the early 2010s, but it remained flat in the 2015-2019 period. Then, a 10% hike was implemented in 2020, and a series of systematic increases was scheduled for the years 2023-2027. According to the legislation passed in 2022, by 2027, the specific component of the excise would reach PLN 367, up from PLN 228 in 2022. In July 2024, the Ministry of Finance proposed that the specific component be increased to PLN 476 in 2027. In October 2024, this path of excise was passed into law. In Figure 19, we report the historical excise per pack of cigarettes and the alternative future scenarios. Note that due to inflation, the real value of excise substantially decreased in the 2019-2023 period.

The affordability of cigarettes has been increasing since 2014. Although the path of excise-duty increases set by the law in 2022 stabilised the price of cigarettes relative to average wages from 2024 onwards, the average wage in 2024 allowed for the purchase of 54% more cigarettes compared to 10 years earlier.

Implementing the more ambitious excise-duty increase path will bring the affordability of cigarettes back to 2021 levels by 2027 (Figure 20). However, it will still be 30% higher than it was in 2014.

Figure 19 / Minimum excise per a pack of cigarettes

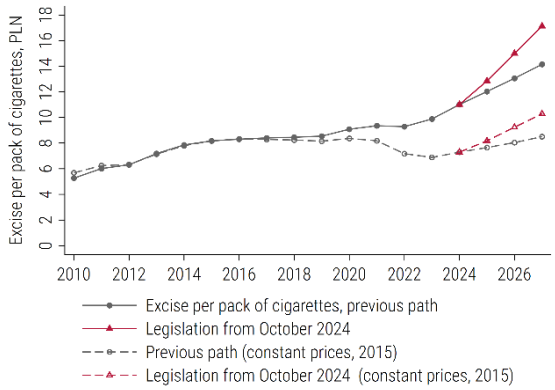
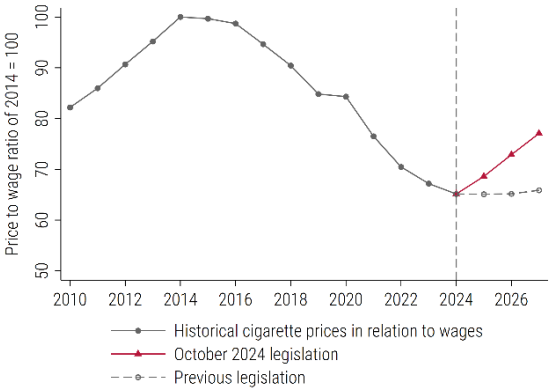


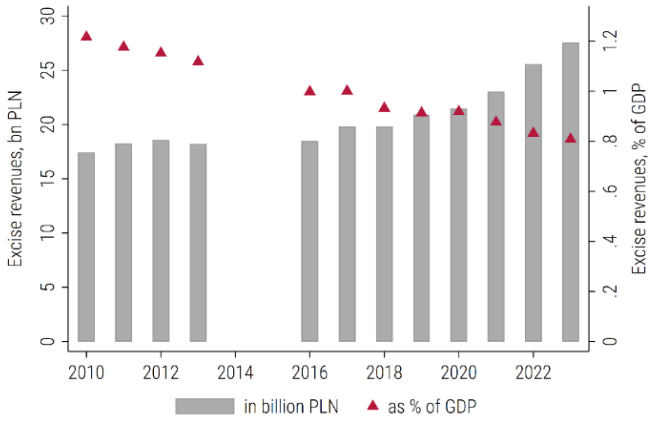
Figure 20 / Affordability of cigarettes as a ratio of average cigarette price to average wage



Source: own depiction based on data from Statistics Poland and the Ministry of Finance

The contribution of tobacco excise to government revenues has steadily declined (Figure 21). It had accounted for 1.22% of GDP in 2010, but this share dropped to 0.81% by 2023. Although excise revenues have increased in nominal terms since 2019, their growth has been slower than that of GDP.

Figure 21 / Total excise revenues related to tobacco products



Source: own depiction based on data from the Ministry of Finance. Data for 2014 and 2015 were not provided by the MoF.

2. Demand elasticities for cigarettes

The aim of this section is to estimate the effects of changes in cigarette prices and households' incomes on the probability of smoking (extensive margin effects) and on the quantity of cigarettes bought (intensive margin effects) in addition to estimating elasticities of total consumption. In the next section, we will use the extensive margin elasticities to construct scenarios of smoking trends under alternative paths of the excise rates.

2.1. METHODOLOGY AND DATA

To estimate the elasticities, we use the HBS data for the 2010-2022 period.[2] The HBS is a rich microdataset containing information on a household's members (including age, educational attainment and employment status) as well as detailed information on a household's expenditures within one month. In particular, households report spending on three categories of tobacco products: (i) cigarettes, (ii) cigars and (iii) other tobacco items. Furthermore, quantities of purchased products are also reported (e.g. the number of cigarettes). Neither expenditure nor consumption is attributed to individual household members.

Such microdata are often used in the research on tobacco control (e.g. Barać et al. 2021; John et al. 2023). A common approach is to apply Deaton's (1988) method, which utilises the variation in prices across geographical clusters. In the Polish case, however, the size of the geographical clusters singled out in the HBS, which are voivodeships (NUTS 2), is too large to satisfy the assumption of uniform prices within clusters.

The key advantage of the Polish HBS data is the panel structure of the survey. Each household that enrols in the survey is also contacted in the following year. In our analysis, we only include households that participated in the survey in two consecutive years. Hence, for each household, we have two observations of monthly incomes and expenditures separated by a year. This allows us to observe the changes in the consumption of tobacco products and to link them to the changes in market-wide prices as well as in the household's financial situation. Furthermore, we drop households that changed the number of members. Although doing so reduces the sample size by 13%, it allows us to minimise the risk that the identified changes in smoking patterns simply reflect smokers moving out of or into the observed households. We also do not need to make assumptions about the changes in the equivalent income due to new births.

In Table 1, we report the number of households entering the sample. Notably, the number of available households is decreasing over time, with the largest declines in the pandemic years of 2020-2022. Still, the number of households buying cigarettes is substantial and enables a rigorous quantitative analysis. It ranges from 2,600 in the most recent period to 3,900 in 2010. In contrast, the number of households purchasing cigars is negligible. There is also a noticeable share of households purchasing other tobacco

[2] Earlier data are also available, but the elasticities inferred from the time when Poland was a significantly poorer country may be of little use for simulation purposes.

products. However, the dataset does not allow us to distinguish between various types of other tobacco products.

Table 1 / Number of households entering the sample

Year when household is first observed	With expenditure on cigarettes	With expenditure on cigars	With expenditure on other tobacco products	All households
2010	3,862	n/a	n/a	13,508
2011	3,842	n/a	n/a	13,409
2012	3,633	n/a	n/a	13,654
2013	3,324	25	610	13,265
2014	3,241	54	713	13,537
2015	3,198	46	691	13,458
2016	3,381	27	690	13,590
2017	3,336	13	748	13,234
2018	3,440	8	738	13,136
2019	3,495	5	740	12,868
2020	3,116	10	710	12,459
2021	2,604	11	606	10,439

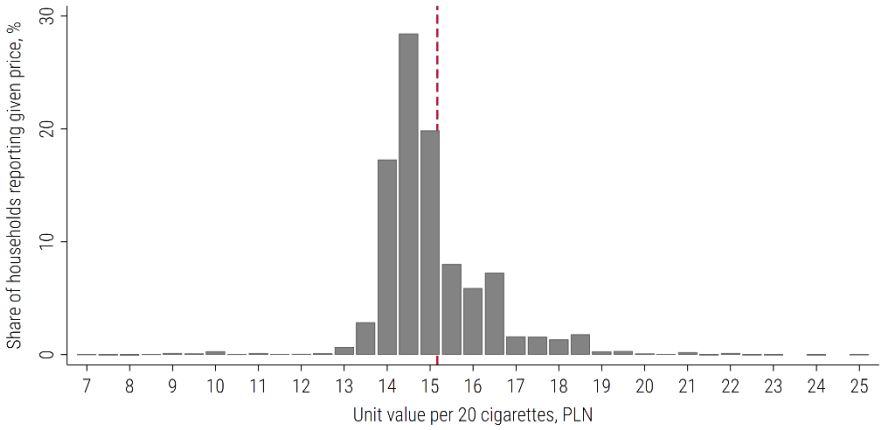
Source: own depiction based on Statistics Poland data

We are primarily interested in the effects of long-term (permanent) changes in cigarette affordability rather than transitory shocks, which may have a minimal impact on consumption (Blundell et al. 2008). For employees or retirees, the year-on-year change in reported income is likely to reflect the actual change in their financial situation. However, this may not be the case for business owners, for whom changes in monthly income may reflect the volatile nature of economic activity. Indeed, the standard deviation of the year-on-year change in income is much larger among households with revenues from economic activity than among the rest of the sample. Therefore, for households with revenues from economic activity, we use their monthly expenditures as a proxy of actual income. From the total value of reported expenditures, we exclude tax payments, real estate purchases, investments in economic activity, and costs related to agricultural business. For other households, we use their reported net income, excluding one-time gains from insurance payouts or the sale of capital or consumption goods.

We winsorise key quantitative variables to minimise the impact of outliers and potential reporting errors. Household expenditures and incomes are winsorised at the 1st and 99th percentiles of year-specific distributions, meaning values below the 1st percentile are replaced with the 1st-percentile value and those above the 99th percentile are similarly capped. For cigarette consumption, only values exceeding the 99th percentile are replaced.

We use a national measure of the WAP of cigarettes, which is announced annually by the Ministry of Finance and serves as a basis for calculating the excise tax. Although we observe unit values paid by individual households, these are endogenous and potentially affected by changes in product choices and measurement errors. In Figure 22, we report the distribution of unit values reported by households in 2022. The unit values are highly concentrated, with 87% of them being between PLN 13.75 and PLN 16.75. However, most observations are below the official average price of PLN 15.17. This can be explained by illicit trade (which is not included in the official statistics), underreporting by households, or the sample composition.

Figure 22 / Distribution of unit values per 20 cigarettes reported by households, 2022



Note: The red dashed line represents the official WAP announced by the Ministry of Finance.
Source: own depiction based on HBS data

In our estimations, we use two dependent variables: (i) a binary variable on whether a household has any expenditures on cigarettes or cigars, and (ii) the logarithm of the number of cigarettes bought. Our main explanatory variable of interest is the logarithm of the relative income price (RIP). Similarly to Nargis et al. (2021), it is defined as the cigarette pack price divided by the disposable income (which we proxy by household expenditures for households with income from business activity, as explained earlier). Formally, we estimate the following model using an ordinary least squares (OLS) estimator:

$$\Delta y_i = \alpha + \beta \times \Delta \ln(RIP_i) + \gamma \times Edu + \zeta \times Age + \epsilon_i, \quad (1)$$

where *i* denotes a household, Δ represents a one-year change, *Edu* is a vector of indicator variables indicating the maximum educational attainment in the household (non-tertiary or tertiary), and *Age* is a vector of indicator variables denoting the age group (18-39, 40-59, 60+) of the head of the household. By including fixed effects for education and age, we can control for different trends in smoking prevalence that may be linked to different social norms across socio-demographic groups. We additionally run specification (1) separately for different age and educational-attainment groups, thus allowing the coefficient β to differ between these groups.

For the logarithm of the number of cigarettes, the coefficient β represents the elasticity of consumption with respect to RIP. For the binary dependent variable, the coefficient β represents semi-elasticity. It measures the percentage-point change in smoking probability in response to a 1% change in RIP. In our interpretation of the results, we multiply the parameter by 10 to determine the expected change in smoking probability resulting from a 10% increase in RIP.

To summarise the overall effects of decreases in cigarette affordability on their consumption, we also estimate a Poisson regression with the number of cigarettes as the dependent variable. Note that in a Poisson regression, the dependent variable can take both positive values and zeros, thus enabling an analysis of changes in the number of consumed cigarettes, including for those households that declare zero consumption in one of the two periods of observation. Formally, we estimate the following panel regression with household-fixed effects:

$$E(y_{i,t} | \alpha_i, \ln(RIP_{i,t})) = \exp(\alpha_i + \beta \times \ln(RIP_{i,t})) \quad (2)$$

2.2. RESULTS

We begin by discussing the results for the extensive margin of smoking. We find a clear link between the affordability of cigarettes and smoking prevalence. A 10% increase in the relative income price of cigarettes translates into a 0.47 pp decrease in the probability that a household will buy cigarettes (Table 2). Moreover, this semi-elasticity parameter differs between education groups, as the affordability of cigarettes has a lower influence on the smoking status of better-educated households. For people without tertiary education, it amounts to 0.60 pp (column 2), while it is only 0.24 pp for tertiary-educated people. In contrast, the differences in semi-elasticities across age groups are less pronounced.

The semi-elasticities can be converted into elasticities by considering the mean smoking prevalence in the relevant sample. For the pooled sample, the extensive margin elasticity equals -0.18 (Table 2). This means that a 10% increase in the relative income price of cigarettes is associated with a 1.8% decrease in the number of households purchasing cigarettes. Among people without tertiary education, it is higher, at 2.2%, while it stands at 1.1% among the tertiary educated.

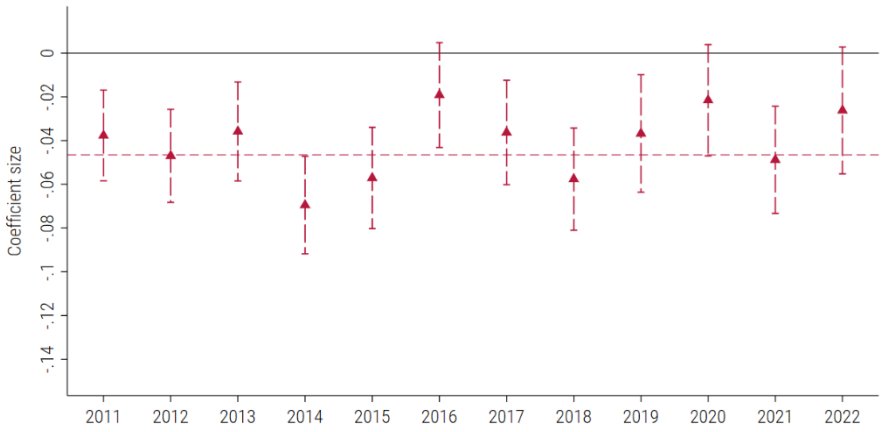
Table 2 / Extensive margin results, all households

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	**All**	**Non-tertiary educated**	**Tertiary educated**	**Age: 18-39**	**Age: 40-59**	**Age: 60+**
Δln(RIP)	-0.047***	-0.060***	-0.024***	-0.045***	-0.053***	-0.037***
	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.006)
Tertiary educated	-0.007***			0.003	-0.012***	-0.008**
	(0.002)			(0.005)	(0.004)	(0.004)
Age: 18-39	-0.006*	-0.012***	0.003			
	(0.003)	(0.005)	(0.004)			
Age: 60+	0.002	0.001	0.004			
	(0.002)	(0.003)	(0.004)			
Constant	-0.001	0.000	-0.011***	-0.012***	0.000	0.001
	(0.002)	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)
Implied elasticity	-0.180	-0.216	-0.111	-0.157	-0.179	-0.179
R-squared	0.002	0.002	0.001	0.001	0.002	0.001
Observations	155,713	108,429	47,284	33,111	59,442	63,160

Note: The dependent variable is a one-year change in a binary variable denoting expenditures on cigarettes or cigars. The main explanatory variable is the one-year difference in the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's income. In column 1, we include all households. In columns 2-3, the sample is split by the maximum educational attainment in a household. In columns 4-6, the sample is split according to the age of the head of the household. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: authors' calculations based on the HBS

Next, we assess the stability of the identified relationship by estimating equation (1) separately for each year between 2010 and 2022. In this approach, the constant absorbs the influence of the price change (which is the same for all households within a year), and the identification is solely through the variation in income changes across households. The relationship between the affordability of cigarettes and smoking status is significantly negative in 10 out of 13 years (Figure 23). Only in one year, 2016, is the estimated coefficient significantly different from the coefficient estimated for the whole sample (i.e. -0.047).

Figure 23 / Extensive margin results for all households, by year



Note: In this figure, we report coefficients pertaining to a one-year change in the logarithm of relative income price of cigarettes, estimated separately for each year. The dashed red line represents the point coefficient estimated for all years jointly.

Now, we turn to the effects of the changes in the relative income price of cigarettes on households that reported buying cigarettes or cigars in the first year of their survey participation. For this group, a 10% increase in the relative income price of cigarettes is associated with a 0.48 pp drop in the probability of buying cigarettes (Table 3). The differences between tertiary and non-tertiary educated people are similar as for the whole sample (Table 2). The implied elasticities are lower than for the whole sample. Here, they are equal to semi-elasticities, as all households buy cigarettes in the first period in this sample.

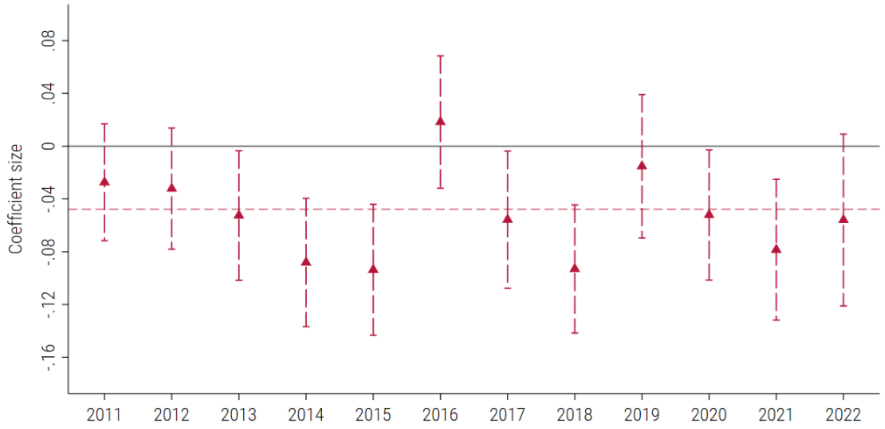
Table 3 / Extensive margin results, households with positive expenditures on cigarettes or cigars in first period

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	**All**	**Non-tertiary educated**	**Tertiary educated**	**Age: 18-39**	**Age: 40-59**	**Age: 60+**
ΔIn(RIP)	-0.048***	-0.058***	-0.026*	-0.043***	-0.045***	-0.061***
	(0.008)	(0.009)	(0.015)	(0.014)	(0.011)	(0.014)
Tertiary educated	-0.021***			-0.043***	-0.039***	0.036***
	(0.006)			(0.011)	(0.009)	(0.011)
Age: 18-39	-0.033***	-0.030***	-0.034***			
	(0.006)	(0.008)	(0.012)			
Age: 60+	-0.029***	-0.046***	0.029**			
	(0.006)	(0.007)	(0.013)			
Constant	-0.309***	-0.304***	-0.343***	-0.334***	-0.304***	-0.350***
	(0.004)	(0.004)	(0.008)	(0.006)	(0.004)	(0.005)
Implied elasticity	-0.048	-0.058	-0.026	-0.043	-0.045	-0.061
R-squared	0.003	0.004	0.003	0.003	0.003	0.002
Observations	40344	30072	10272	9512	17638	13194

Note: The dependent variable is a one-year change in a binary variable denoting expenditures on cigarettes or cigars. The main explanatory variable is the one-year difference in the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's income. In column 1, we include all households. In columns 2-3, the sample is split by the maximum educational attainment in a household. In columns 4-6, the sample is split according to the age of the head of the household. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: authors' calculations based on the HBS

The estimated relationship between the affordability of cigarettes and the cessation of smoking demonstrates some volatility across different years (Figure 24). The coefficient of interest ranges from -0.093 in 2018 to -0.018 in 2016. However, only in 2016 is it different from the coefficient estimated for the whole sample.

Figure 24 / Extensive margin results for households with positive expenditures on cigarettes or cigars in first period, by year



Note: In this figure, we report coefficients pertaining to a one-year change in the logarithm of relative income price of cigarettes, estimated separately for each year. The dashed red line represents the point coefficient estimated for all years jointly.

For households with no recorded expenditures on cigarettes in the first period, a 10% increase in the relative income price of cigarettes results in a 0.35 pp reduction in the likelihood of buying cigarettes in the second period, which can be interpreted as a likelihood of smoking initiation (Table 4). Although this semi-elasticity is smaller than that observed in the subsample of existing smokers, these two results cannot be directly compared. Importantly, among households that do not purchase cigarettes, the probability of altering their smoking status in the following year is substantially lower compared to households with positive expenditures on cigarettes (see Figure 8). For tertiary-educated people, the decision to start smoking is the least related to the affordability of cigarettes.

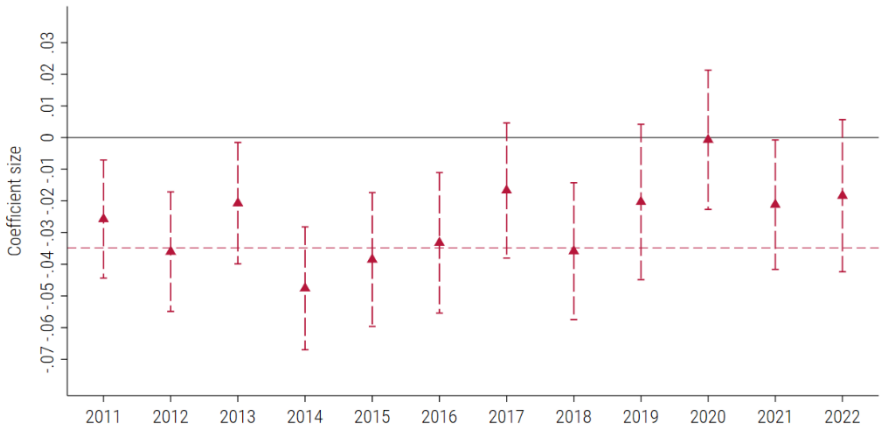
The estimated relationship between the affordability of cigarettes and smoking initiation is mostly stable across years (Figure 25). Only the coefficient for 2020 may be considered an outlier, with no detected relationship between the affordability of cigarettes and starting to smoke.

Table 4 / Extensive margin results, households with no expenditures on cigarettes or cigars in first period

Sample	(1) All	(2) Non-tertiary educated	(3) Tertiary educated	(4) Age: 18-39	(5) Age: 40-59	(6) Age: 60+
Δln(RIP)	-0.035***	-0.047***	-0.016***	-0.030***	-0.043***	-0.028***
	(0.003)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)
Tertiary educated	-0.055***			-0.073***	-0.067***	-0.027***
	(0.002)			(0.005)	(0.003)	(0.003)
Age: 18-39	0.008***	0.013***	0.007*			
	(0.003)	(0.005)	(0.004)			
Age: 60+	-0.049***	-0.059***	-0.019***			
	(0.002)	(0.003)	(0.004)			
Constant	0.148***	0.153***	0.087***	0.166***	0.153***	0.094***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
R-squared	0.012	0.011	0.002	0.013	0.012	0.002
Observations	115,369	78,357	37,012	23,599	41,804	49,966

Note: The dependent variable is a one-year change in a binary variable denoting expenditures on cigarettes or cigars. The main explanatory variable is the one-year difference in the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's income. In column 1, we include all households. In columns 2-3, the sample is split by the maximum educational attainment in a household. In columns 4-6, the sample is split according to the age of the head of the household. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: authors' calculations based on the HBS

Figure 25 / Extensive margin results for households with no expenditures on cigarettes or cigars in first period, by year



Note: In this figure, we report coefficients pertaining to a one-year change in the logarithm of relative income price of cigarettes, estimated separately for each year. The dashed red line represents the point coefficient estimated for all years jointly.

Now, we turn to the results for the intensive margin. We use a one-year change in the log of cigarettes bought as a dependent variable and estimate our model on the sample comprising only households with positive cigarette purchases in both periods. We find a significant negative relationship between the relative income price of cigarettes and their quantity bought by households (Table 5). A 1% increase in the relative income price translates into a 0.28% lower quantity of cigarettes consumed. We also detect heterogeneities across educational groups. Households with tertiary-educated members exhibit a

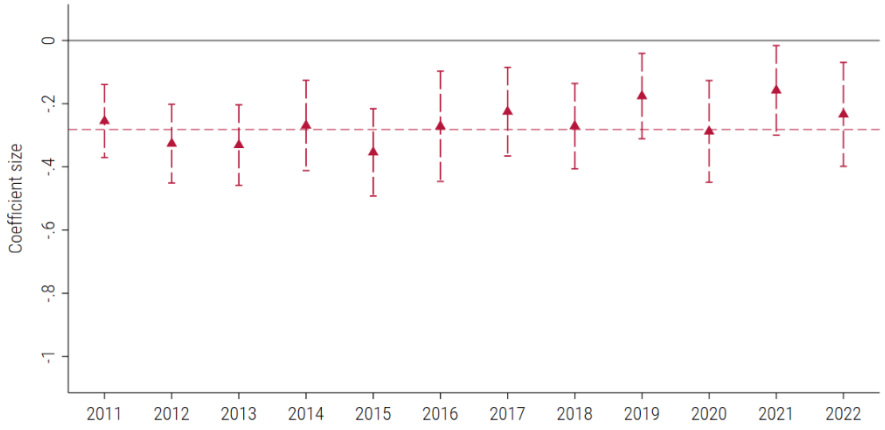
smaller (in absolute terms) elasticity, of -0.22, and those without tertiary-educated members a larger elasticity, of -0.31.

Table 5 / Intensive margin results, households with positive expenditures on cigarettes in both periods

Sample	(1) All	(2) Non-tertiary educated	(3) Tertiary educated	(4) Age: 18-39	(5) Age: 40-59	(6) Age: 60+
Δln(RIP)	-0.282***	-0.307***	-0.218***	-0.277***	-0.286***	-0.279***
	(0.021)	(0.025)	(0.040)	(0.040)	(0.031)	(0.038)
Tertiary educated	0.026*			0.042	0.014	0.029
	(0.015)			(0.030)	(0.022)	(0.027)
Age: 18-39	-0.018	-0.027	0.003			
	(0.018)	(0.022)	(0.030)			
Age: 60+	0.001	-0.003	0.012			
	(0.015)	(0.017)	(0.030)			
Constant	-0.021*	-0.018	-0.003	-0.044**	-0.018	-0.02
	(0.011)	(0.012)	(0.019)	(0.018)	(0.012)	(0.013)
R-squared	0.009	0.01	0.006	0.01	0.009	0.008
Observations	26,858	20,139	6,719	6,175	12,063	8,620

Note: The dependent variable is a one-year change in the log of the quantity of cigarettes bought. The main explanatory variable is the one-year difference in the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's income. In column 1, we include all households. In columns 2-3, the sample is split by the maximum educational attainment in a household. In columns 4-6, the sample is split according to the age of the head of the household. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: authors' calculations based on the HBS

Figure 26 / Intensive margin results, by year



Note: In this figure, we report coefficients pertaining to a one-year change in the logarithm of relative income price of cigarettes, estimated separately for each year. The dashed red line represents the point coefficient estimated for all years jointly.

The estimated elasticities are similar when the estimation strategy utilises only the variance if income changes across households in a given year, by again re-estimating the regression for particular years. In

all years, the elasticities are significantly negative and not significantly different from the coefficient pertaining to the whole sample, -0.28 (Figure 26).

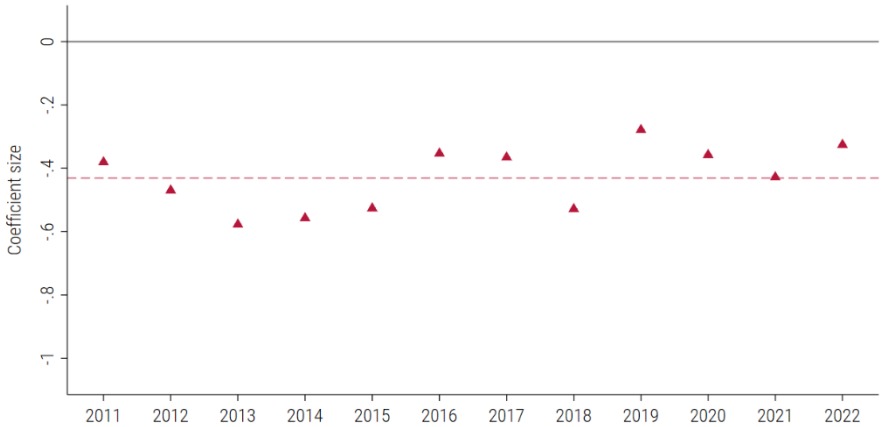
In Table 6, we report the Poisson regression results, which can be interpreted as the elasticity of total cigarette consumption with respect to the relative income price. For the pooled sample, a 10% increase in the cigarette price relative to a household's income is associated with a 4.3% decrease in the number of cigarettes bought (elasticity of -0.43). This elasticity is the largest among households with lower education levels (-0.48) and among prime-aged households (-0.46). Consistent with the previous findings, cigarette consumption of people with tertiary education is the least sensitive to changes in cigarette affordability (-0.33). There is some degree of heterogeneity in the elasticities estimated separately for each year (Figure 27). The coefficients range from -0.28 in 2019 to -0.58 in 2013.

Table 6 / Results of Poisson regressions

Sample	(1) All	(2) Non-tertiary educated	(3) Tertiary educated	(4) Age: 18-39	(5) Age: 40-59	(6) Age: 60+
Ln(RIP)	-0.431***	-0.475***	-0.332***	-0.404***	-0.459***	-0.405***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	106,124	79,210	25,784	22,950	42,368	31,762

Note: In this table, we report the estimation results of equation (2). The dependent variable is the number of cigarettes bought. The explanatory variable is the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's total expenditures, excluding capital expenditures. Household-fixed effects are included. Households with no cigarettes bought in any period are not included in Poisson regressions. In column 1, we include all households that bought cigarettes. In columns 2-4, the sample is split by the maximum educational attainment in a household. In columns 5-7, the sample is split according to the age of the head of the household. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: authors' calculations based on the HBS

Figure 27 / Poisson regression results, by year



Note: In this figure, we report coefficients pertaining to a one-year change in the logarithm of relative income price of cigarettes, estimated separately for each year. The dashed red line represents the point coefficient estimated for all years jointly.

3. Simulated effects of increases in the excise tax

In this section, we quantify the expected effects of changes in tobacco excise on smoking prevalence in Poland between 2025 and 2027.

3.1. METHODOLOGY

The simulation accounts for the differences in semi-elasticities of smoking with respect to the relative income price across socio-demographic groups. We re-estimate equation (1) for six groups of households, defined according to the age of the head of the household (below 40, between 40 and 59, and over 60) and level of educational attainment (tertiary education, without tertiary education). The semi-elasticity is the highest for households of young people without tertiary education and the lowest for households with tertiary-educated members, either young or older than 59 years (Table 7). Another parameter entering the simulation is the unconditional trend in smoking prevalence. It is the constant from the above-mentioned regressions divided by the mean share of smokers in a given socio-demographic group. Hence, it is a relative change in the number of smokers that can be attributed to factors other than economic ones (e.g. to social norms).

Our simulation of smoking prevalence aims to represent the shares of individuals rather than the share of households. Therefore, the data on smoking prevalence within specific socio-demographic groups is obtained from the EHIS. Since the latest data point from this survey is from 2019, we extrapolate it to 2022 using the change from 2019 to 2022 observed in the household budget data for households of given characteristics. The last parameter used is the population share of a given socio-demographic group, which is also derived from the 2019 EHIS data. Table 7 summarises the parameters used for simulations.

To assess the role of economic policy, we consider two contrasting paths for tobacco excise. The first one follows the previous Polish legislation, which implied a cumulative increase in cigarette prices of 42% from 2023 to 2027. Under this scenario, the 2027 excise would reach EUR 163, approximately matching the amount prescribed by the 2022 draft of the revised EU Council directive. The second scenario reflects the new excise path enacted into law in October 2024 (see Figure 19), with a cumulative nominal cigarette price increase of 66% over the 2023-2027 period. These two excise paths are used to construct alternative changes in relative income prices (RIP) for the 2025-2027 period. In both scenarios, we assume that households' nominal income will grow in line with the wage growth forecasted by the Polish Ministry of Finance. Using group-specific semi-elasticities and unconditional trends, we simulate smoking prevalence within each group. The country-level smoking prevalence is then obtained by aggregating the results across all groups.

Table 7 / Parameters used in simulations of smoking prevalence

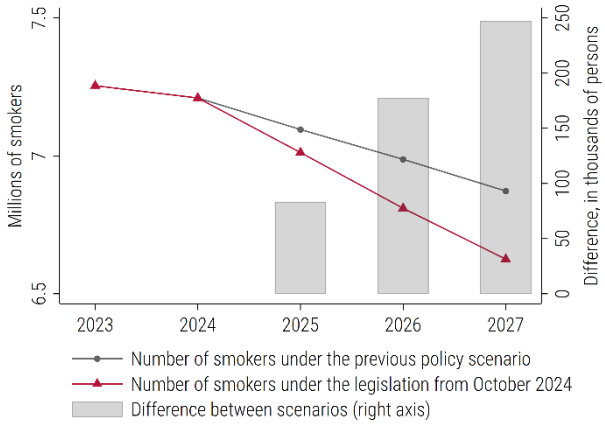
Education level	Age group	Semi-elasticity with respect to RIP	Unconditional trend, % of smokers	Smoking prevalence in 2022, %	Share in population, %
Primary, lower secondary and upper secondary	18-39	-0.074***	-3.5%	30.7%	22.5%
	40-59	-0.066***	0.0%	31.6%	24.8%
	60+	-0.043***	0.5%	21.0%	27.1%
Tertiary	18-39	-0.016*	-3.7%	10.9%	13.4%
	40-59	-0.033***	-4.9%	11.5%	8.1%
	60+	-0.018	-3.8%	12.6%	4.0%

Source: authors' calculations based on the EHIS data and the HBS

3.2. RESULTS

We find that in the previous, less ambitious scenario of excise hikes, the smoking prevalence in Poland would decrease from 23.1% in 2024 to 22.1% in 2027. In contrast, a policy of more ambitious excise increases (to be implemented beginning in 2025) will likely lower smoking prevalence to 21.3% by 2027. The difference between these two scenarios amounts to 0.8 pps over three years. Given the projected adult population of 31.0 million in 2027, it translates into 247,000 people who could alter their smoking behaviour due to economic policy (Figure 28). Medical research indicates that every 100 people who abstain from smoking translates into 30-50 fewer premature deaths (Levy et al. 2013). The more ambitious excise tax hikes would therefore reduce premature deaths by at least 74,000. Furthermore, evaluating the alternative excise paths using a total consumption elasticity of -0.43 (Table 6), we conclude that the new law could reduce cigarette consumption by 7.3% compared to the previous policy scenario.

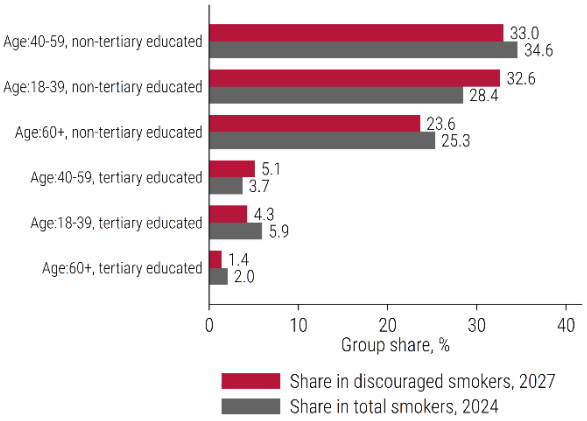
Figure 28 / Simulation of the number of smokers under alternative excise path scenarios



Source: authors' calculations based on the HBS and the EHIS

Next, we look at the decomposition of the overall reform effects into specific socio-demographic groups (Figure 29). Although tertiary-educated individuals make up over 25% of the adult population, only 10.8% of the reduction in smoking incidence (27,000 cases) can be attributed to this group.[3] The relatively low effects in that group can be explained by both low smoking prevalence and the lower sensitivity of smoking to changes in cigarette affordability. In contrast, the expected impacts of higher excise are sizeable among young and prime-aged persons without tertiary education.

Figure 29 / Simulation results by socio-demographic groups



Source: authors' calculations based on the HBS and the EHIS

It is important to note that the risks of increased illicit trade following excise hikes are limited. A study by KPMG[4] (2024) shows that cigarettes without domestic excise duty accounted for only 4.6% of total consumption in 2023, which was significantly below the historical levels of over 10% recorded between 2011 and 2018. This can partly be attributed to better market surveillance (including the 'Track & Trace' system), reduced traffic at the borders with Belarus and Ukraine, and the lower popularity of street and bazaar trade. Inactive channels of illegal trade reduce the risk of increased activity following excise duty increases.

[3] In this study, we assume constant shares of socio-demographic groups over the 2022-2027 period. However, a likely increase in the share of households of tertiary-educated persons could lower the overall smoking prevalence in Poland.

[4] This study is funded by the tobacco industry, which may potentially have some impact on its findings.

4. Concluding remarks

In this report, we have analysed the impact of tobacco excise taxes on smoking prevalence in Poland. While smoking has become less popular among tertiary-educated individuals over the last decade, smoking prevalence remains high among the non-tertiary-educated population. The early 2010s saw a series of excise hikes that decreased the affordability of cigarettes. However, after 2014, affordability systematically increased, and the average wage in 2024 allows for the purchase of 54% more cigarettes compared to 10 years earlier.

We showed that a 10% increase in cigarette prices relative to income decreases the number of smokers by 1.8% and reduces cigarette consumption by 4.3%. This link between cigarette affordability and smoking is particularly strong among lower-educated and less affluent households. We also assessed the new path of excise hikes passed into law in October 2024, which aims to reduce cigarette affordability and bring it back to the level of 2021 by 2027. Our projections suggest that this policy will prevent 247,000 Poles from smoking and will avert 74,000 premature deaths, compared with the earlier roadmap of tobacco excise.

Our report focused on the adult population and traditional cigarettes. However, the growing popularity of alternative tobacco products, particularly among the youth, is also a significant concern. According to the 2022 Global Youth Tobacco Survey (WHO 2023), 22% of students aged 13-15 were e-cigarette users and 12% smoked traditional cigarettes. While price increases on tobacco products will likely reduce smoking among young people, the prevalence of alternative products among young people and their overall popularity requires further analysis.

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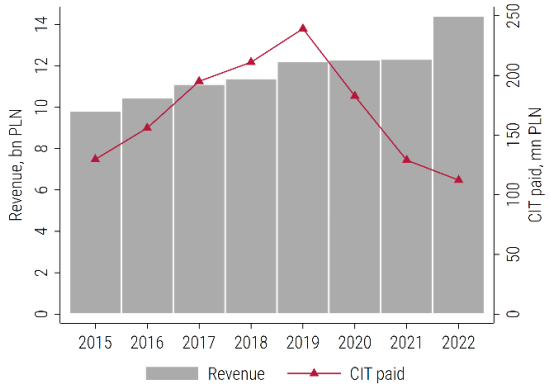
Appendix

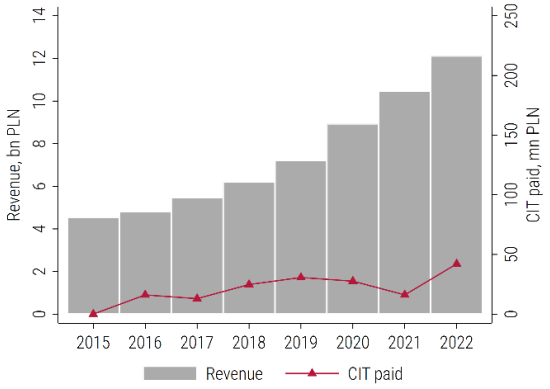
APPENDIX A - CIT TAX PAID BY TOBACCO COMPANIES

Figure A1 / CIT tax paid by the Philip Morris group



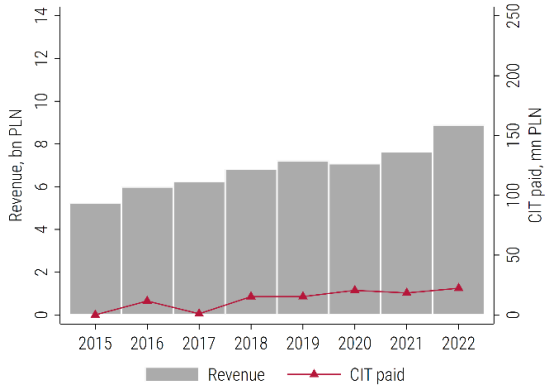
Note: We report the sums of revenues and CIT of Philip Morris Polska Distribution Sp. z o.o. and Philip Morris Polska S.A.

Figure A2 / CIT tax paid by the Japan Tobacco International group



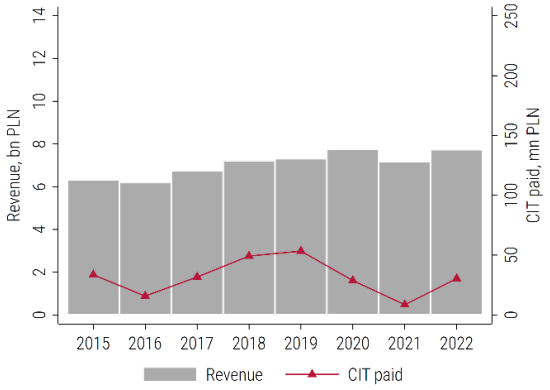
Note: We report the revenue and CIT of JTI Polska Sp. z o.o.

Figure A3 / CIT tax paid by the British American Tobacco



Note: We report the sums of revenues and CIT of British American Tobacco Polska Trading Sp. z o.o. and British-American Tobacco Polska S.A.

Figure A4 / CIT tax paid by the Imperial Tobacco group



Note: We report the sums of revenues and CIT of Imperial Tobacco Polska S.A. and Imperial Tobacco Polska Manufacturing S.A.

APPENDIX B - ADDITIONAL RESULTS

In Tables B.1–B.3, we present the main analyses of cigarette demand elasticities, estimated separately for five income groups. Each household is assigned to one of the year-specific income quintiles based on its equivalised income in the first year of observation. We find that smoking prevalence is least sensitive to economic factors among the most affluent households, belonging to the 4th and 5th quintiles (Table B.1). The implied elasticities are highest in the 2nd and 3rd quintiles. The intensive margin effects (Table B.2) are similar across the first four quintiles and significantly lower in the 5th quintile. The total consumption elasticity, estimated using Poisson regression, is highest among the 2nd and 3rd quintiles, reaching -0.50. However, it remains substantial across all groups.

Table B1 / Extensive margin results, by income groups

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	**All**	**1st quintile**	**2nd quintile**	**3rd quintile**	**4th quintile**	**5th quintile**
Δln(RIP)	-0.047***	-0.043***	-0.056***	-0.063***	-0.043***	-0.036***
	(0.004)	(0.007)	(0.010)	(0.009)	(0.009)	(0.007)
Edu: Tertiary	-0.007***	-0.013	-0.012*	-0.009	0.000	-0.008
	(0.002)	(0.008)	(0.007)	(0.006)	(0.005)	(0.005)
Age: 18-39	-0.006*	-0.012	-0.004	-0.001	-0.004	-0.008
	(0.003)	(0.008)	(0.008)	(0.008)	(0.007)	(0.006)
Age: 60+	0.002	-0.003	0.002	-0.002	0.005	0.012**
	(0.002)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
Constant	-0.001	0.007	-0.002	-0.004	-0.006	-0.001
	(0.002)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Implied elasticity	-0.180	-0.173	-0.222	-0.238	-0.158	-0.137
R-squared	0.002	0.002	0.002	0.002	0.001	0.002
Observations	155,713	32,101	31,004	31,237	30,705	30,656

Note: The dependent variable is a one-year change in a binary variable denoting expenditures on cigarettes or cigars. The main explanatory variable is a one-year difference in the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's income. In column 1, we include all households. In columns 2-6, we report the results for households belonging to one of the quintiles of the equivalised income distribution, based on their position in the first period of observation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: authors' calculations based on the HBS

Table B2 / Intensive margin results, by income groups

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
Δln(RIP)	-0.282***	-0.307***	-0.348***	-0.322***	-0.352***	-0.189***
	(0.021)	(0.043)	(0.053)	(0.055)	(0.048)	(0.043)
Edu: Tertiary	0.026*	0.022	-0.004	0.051	0.013	-0.032
	(0.015)	(0.057)	(0.051)	(0.036)	(0.029)	(0.028)
Age: 18-39	-0.018	0.043	-0.04	-0.065*	-0.013	-0.011
	(0.018)	(0.048)	(0.045)	(0.039)	(0.035)	(0.034)
Age: 60+	0.001	0.007	0.014	0.015	-0.023	0.013
	(0.015)	(0.035)	(0.035)	(0.034)	(0.033)	(0.032)
Constant	-0.021*	-0.061**	-0.042*	-0.023	0.000	0.029
	(0.011)	(0.024)	(0.025)	(0.024)	(0.024)	(0.025)
R-squared	0.009	0.016	0.009	0.01	0.011	0.005
Observations	26,858	5,081	5,030	5,419	5,740	5,587

Note: The dependent variable is a one-year change in the log of the quantity of cigarettes bought. The main explanatory variable is a one-year difference in the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's income. In column 1, we include all households. In columns 2-6, we report the results for households belonging to one of the quintiles of the equivalised income distribution, based on their position in the first period of observation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: authors' calculations based on the HBS

Table B3 / Results of Poisson regressions, by income groups

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
ln(RIP)	-0.431***	-0.385***	-0.498***	-0.501***	-0.456***	-0.385***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	106,124	21,652	20,778	21,628	21,684	20,374

Note: In this table, we report the estimation results of equation (2). The dependent variable is the number of cigarettes bought. The explanatory variable is a one-year difference in the logarithm of the relative income price (RIP), defined as the price of a cigarette pack divided by the household's income. Household-fixed effects are included. Households with no cigarettes bought in any period are not included in Poisson regressions. In column 1, we include all households. In columns 2-6, we report the results for households belonging to one of the quintiles of the equivalised income distribution, based on their position in the first period of observation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Source: authors' calculations based on the HBS

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