

**Title:**

Can indirect methods be used as an approximation to estimate alcohol excise taxation revenue?

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## Supplementary Materials A: Reported revenue data

**Table S1.** Sources of tax revenue

Austria	Statistics Austria. Tax revenue 2023. <a href="https://www.statistik.at/en/statistics/national-economy-and-public-finance/public-finance/public-finance/tax-revenue">https://www.statistik.at/en/statistics/national-economy-and-public-finance/public-finance/public-finance/tax-revenue</a> . Accessed 22 March 2024
Belgium	National Bank of Belgium Online Statistics. Received taxes and actual social contributions by kind. 2023. <a href="https://stat.nbb.be/Index.aspx?DataSetCode=NFGOVTSC">https://stat.nbb.be/Index.aspx?DataSetCode=NFGOVTSC</a> . Accessed 13 June 2024
Cyprus	Republic of Cyprus, Statistical Service. Detailed list of taxes and social contributions, annual (2023). <a href="https://cystatdb.cystat.gov.cy/pxweb/en/8.CYSTAT-DB/8.CYSTAT-DB_Public%20Finance_3.%20%CE%95%CE%B9%CF%83%CF%80%CF%81%CE%B1%CF%87%CE%B8%CE%AD%CE%BD%CF%84%CE%B5%CF%82%20%CE%A6%CF%8C%CF%81%CE%BF%CE%B9%20%CE%BA%CE%B1%CE%B9%20%CE%9A%CE%BF%CE%B9%CE%BD%CF%89%CE%BD%CE%B9%CE%BA%CE%AD%CF%82%20%CE%95%CE%B9%CF%83%CF%86%CE%BF%CF%81%CE%AD%CF%82%20-%20Taxes%20and%20Social%20Contribution%20Receipts/0530010E.px/">https://cystatdb.cystat.gov.cy/pxweb/en/8.CYSTAT-DB/8.CYSTAT-DB_Public%20Finance_3.%20%CE%95%CE%B9%CF%83%CF%80%CF%81%CE%B1%CF%87%CE%B8%CE%AD%CE%BD%CF%84%CE%B5%CF%82%20%CE%A6%CF%8C%CF%81%CE%BF%CE%B9%20%CE%BA%CE%B1%CE%B9%20%CE%9A%CE%BF%CE%B9%CE%BD%CF%89%CE%BD%CE%B9%CE%BA%CE%AD%CF%82%20%CE%95%CE%B9%CF%83%CF%86%CE%BF%CF%81%CE%AD%CF%82%20-%20Taxes%20and%20Social%20Contribution%20Receipts/0530010E.px/</a> Accessed on 26 March 2024
Denmark	Statistics Denmark. SKAT: Taxation total, divided into rates and dues by type. 2024. <a href="https://www.statbank.dk/statbank5a/selectvarval/define.asp?PLanguage=1&amp;subword=tabel&amp;MainTable=SKAT&amp;PXSID=235966&amp;tablestyle=&amp;ST=SD&amp;buttons=0">https://www.statbank.dk/statbank5a/selectvarval/define.asp?PLanguage=1&amp;subword=tabel&amp;MainTable=SKAT&amp;PXSID=235966&amp;tablestyle=&amp;ST=SD&amp;buttons=0</a> . Accessed 29 March 2024
Estonia	Statistics Estonia. RR01: state budget tax revenues by year and indicator. 2023. Available from: <a href="https://andmed.stat.ee/en/stat/majandus_rahandus_valitsemisspektori-rahandus_maksud/RR01">https://andmed.stat.ee/en/stat/majandus_rahandus_valitsemisspektori-rahandus_maksud/RR01</a> . Accessed 20 March 2024.
Finland	Statistics Finland's free statistical databases. 2024. <a href="https://pxdata.stat.fi/PxWeb/pxweb/fi/StatFin/">https://pxdata.stat.fi/PxWeb/pxweb/fi/StatFin/</a> . Accessed 02 April 2024
Germany	GENESIS-Online Datenbank. Steuereinnahmen: Deutschland, Jahre, Steuerarten vor der Steuerverteilung. Wiesbaden: Statistisches Bundesamt; 2023.
Ireland	Revenue Commissioners. Revenue annual reports. 2023. <a href="https://data.gov.ie/dataset/revenue-annual-reports">https://data.gov.ie/dataset/revenue-annual-reports</a> . Accessed 06 April 2024
Italy	Istituto nazionale di Statistica. National accounts. 2023. <a href="https://www.istat.it/en/national-accounts?data-and-indicators">https://www.istat.it/en/national-accounts?data-and-indicators</a> . Accessed 06 April 2024
Lithuania	Statistics Lithuania. Official Statistics Portal. Economy and finance (macroeconomics) taxes paid by enterprises and residents. 2023. Available from: <a href="https://osp.stat.gov.lt/statistiniu-rodikliu-analize#">https://osp.stat.gov.lt/statistiniu-rodikliu-analize#</a> . Accessed 20 March 2024.
Poland	Manthey J, Gobiņa I, Isajeva L, Neneman J, Reile R, Štelemėkas M, Rehm J. The Impact of raising alcohol taxes on government tax revenue: Insights from five European countries (Appendix). Applied Health Economics and Health Policy. 2024 Feb 22:1-2.
Portugal	Statistics Portugal. Tax revenue statistics. 2022. <a href="https://www.ine.pt/xportal/xmain?xpid=INE&amp;xpgid=ine_destaques&amp;DESTAQUESdest_boui=536482520&amp;DESTAQUESmodo=2">https://www.ine.pt/xportal/xmain?xpid=INE&amp;xpgid=ine_destaques&amp;DESTAQUESdest_boui=536482520&amp;DESTAQUESmodo=2</a> . Accessed 15 April 2024

Romania	National Institute of Statistics. The level of government debt and deficit. 2023. <a href="https://insse.ro/cms/ro/content/nivelul-datoriei-%C8%99i-deficitului-guvernamental">https://insse.ro/cms/ro/content/nivelul-datoriei-%C8%99i-deficitului-guvernamental</a> . Accessed 15 April 2024
Slovenia	Republic of Slovenia Statistical Office. Detailed classification of national taxes and social contributions according to ESA 2010 by receiving sector, mio EUR, Slovenia, annually. 2023. <a href="https://pxweb.stat.si/SiStatData/pxweb/en/Data/Data/0314980S.px/">https://pxweb.stat.si/SiStatData/pxweb/en/Data/Data/0314980S.px/</a> . Accessed 18 April 2024
Spain	Agencia Tributaria. Tax collection 2024. <a href="https://sede.agenciatributaria.gob.es/Sede/datosabiertos/catalogo/hacienda/Informe_mensual_de_Recaudacion_Tributaria.shtml">https://sede.agenciatributaria.gob.es/Sede/datosabiertos/catalogo/hacienda/Informe_mensual_de_Recaudacion_Tributaria.shtml</a> . Accessed 20 March 2024
Sweden	The Statistics Authority. 2023. <a href="https://www.scb.se/hitta-statistik/sok/?query=Questionnaire+NTL+&amp;lang=sv">https://www.scb.se/hitta-statistik/sok/?query=Questionnaire+NTL+&amp;lang=sv</a> . Accessed 13 June 2024
United Kingdom	Office for National Statistics. Detailed tax and social contributions: ESA questionnaire. 2023. <a href="https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/publicspending/datasets/esaquestionnairedetailedtaxandsocialcontributions">https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/publicspending/datasets/esaquestionnairedetailedtaxandsocialcontributions</a> . Accessed 20 April 2024

**Table S2.** Reported alcohol excise tax revenue, 2022.

Country	Population (15+)	Reported currency unit (RCU)	Alcohol Excise Tax Revenue (total, RCU)	Alcohol Excise Tax Revenue ( <i>per capita</i> , RCU)
Austria	7,654,271	EUR	381,882,371	50
Belgium	9,728,784	EUR	525,300,000	54
Cyprus	1,052,138	EUR	39,100,000	37
Denmark	4,937,587	DKK	3,887,130,000	787
Estonia	1,108,506	EUR	242,110,350	218
Finland	4,700,055	EUR	1,478,000,000	314
Germany	71,732,933	EUR	3,172,664,000	44
Ireland	4,039,372	EUR	1,229,000,000	304
Italy	51,698,969	EUR	1,477,000,000	29
Lithuania	2,328,645	EUR	438,634,000	188
Poland	33,818,583	EUR	3,031,136,062	90
Portugal	8,916,906	EUR	277,758,000	31
Romania	16,529,732	RON	1,597,700,000	97
Slovenia	1,799,396	EUR	124,700,000	69
Spain	40,996,551	EUR	1,246,629,000	30
Sweden	8,692,685	SEK	16,590,000,000	1,909
United Kingdom	55,717,338	GBP	12,546,000,000	225

## Supplementary Materials B: Excise share-based method

**Table S3.** Excise tax share in the final retail price of alcoholic beverages by type and overall average, 2022.

Country	Beer	Wine	Spirits	Overall*
Austria	7.7%	0.0%	19.1%	6.9%
Belgium	10.5%	18.7%	39.8%	17.9%
Cyprus	11.8%	0.0%	21.2%	11.8%
Denmark	11.5%	14.3%	13.2%	13.1%
Estonia	18.4%	13.9%	57.9%	34.9%
Finland	28.8%	36.4%	66.8%	40.9%
Germany	5.6%	0.0%	40.3%	10.7%
Ireland	25.6%	39.8%	48.6%	35.9%
Italy	12.3%	0.0%	8.9%	4.0%
Lithuania	16.7%	24.6%	52.1%	33.9%
Poland	17.7%	6.1%	47.8%	28.9%
Portugal	10.7%	0.0%	29.2%	6.0%
Romania	4.4%	0.0%	25.2%	7.1%
Slovenia	19.8%	0.0%	17.4%	10.2%
Spain	4.8%	0.0%	36.0%	9.1%
Sweden	38.5%	43.9%	66.8%	45.5%
United Kingdom	27.5%	38.2%	47.2%	37.0%

\* The overall excise tax share was calculated for each country as a weighted average of the beverage-specific shares for beer, wine, and spirits, using the relative contribution of each beverage to total recorded alcohol consumption.

## Supplementary Materials C: Tax-and-consumption-based method

This method estimates alcohol excise tax revenue *per capita* for 2022 using actual excise tax rates and recorded alcohol consumption, disaggregated by beverage type (beer, wine, spirits). It combines data on adult (15+) alcohol consumption (in litres of pure alcohol *per capita*), beverage characteristics (alcohol by volume and unit volume), and tax amount per unit product. The final output of the method is the estimated *per capita* excise revenue in euros.

### *Step 1: Estimate revenue per beverage*

For each country  $i$ , convert recorded per capita alcohol consumption (in litres of pure alcohol) into *per capita* number of taxed units, assuming average alcohol by volume (ABV) and unit volume (in millilitres) for each beverage  $b$ :

$$\text{Units}_{i,b} = \frac{\text{Recorded APC}_{i,b}}{\text{ABV}_{i,b}} \div \left( \frac{\text{Unit volume}_{i,b}}{1000} \right)$$

Multiply the number of units by the excise tax amount per unit (see Table S2) to obtain revenue *per capita* in local currency (LCU):

$$\text{Revenue}_{i,b} = \text{Units}_{i,b} \times \text{Tax}_{i,b}$$

### *Step 2: Aggregate by country*

For each country, the total estimated excise revenue *per capita* in LCU was obtained by summing the beverage-specific estimates:

$$\text{Total revenue}_i = \sum_b \text{Revenue}_{i,b}$$

### *Step 3: Convert to euros*

Local revenue estimates were converted to euros using the official 2022 average exchange rate of local currency per USD (LCU/USD) and the 2022 EUR per USD (EUR/USD) exchange factor:

$$\text{Total revenue EUR}_i = \text{Total revenue}_i \times \frac{\text{Exchange factor EUR/USD}}{\text{Exchange factor LCU/USD}_i}$$

This gives the **estimated per capita alcohol excise tax revenue in euros** for each country based on actual consumption patterns and tax rates.

**Table S4.** Alcohol excise tax rates and calculation methods, by beverage type, 2022.

Country	Beverage	Unit volume	ABV (%)	Currency	Excise tax type	Tax rate (LCU)	Tax calculation	Tax amount per unit (LCU)
Austria	Wine	750	12.0%	EUR	Not applied	-	-	0.00
Austria	Spirits	750	37.5%	EUR	Alcohol-content specific	12.00	Tax * ABV * Vol / 1,000	3.38
Austria	Beer	330	5.2%	EUR	Alcohol-content specific	2.00	Tax * (ABV * 100) * (1 / 0.4) * Vol / 100,000	0.09
Belgium	Wine	750	13.5%	EUR	Volumetric specific	74.91	Tax * Vol / 100,000	0.56
Belgium	Spirits	750	37.5%	EUR	Alcohol-content specific	2,992.79	Tax * ABV * Vol / 100,000	8.42
Belgium	Beer	330	5.2%	EUR	Alcohol-content specific	2.00	Tax * (ABV * 100) * (1 / 0.4) * Vol / 100,000	0.09
Cyprus	Spirits	750	40.0%	EUR	Alcohol-content specific	956.82	Tax * ABV * Vol / 100,000	2.87
Cyprus	Wine	750	12.5%	EUR	Not applied	-	-	0.00
Cyprus	Beer	330	4.5%	EUR	Alcohol-content specific	6.00	Tax * (ABV * 100) * Vol / 100,000	0.09
Denmark	Beer	330	4.6%	DKK	Alcohol-content specific	48.74	Tax * ABV * Vol / 1,000	0.74
Denmark	Spirits	750	17.0%	DKK	Alcohol-content specific	150.00	Tax * ABV * Vol / 1,000	19.13
Denmark	Wine	750	14.0%	DKK	Volumetric specific	11.26	Tax * Vol / 1,000	8.45
Estonia	Beer	330	4.6%	EUR	Alcohol-content specific	12.70	Tax * (ABV * 100) * Vol / 100,000	0.19
Estonia	Spirits	750	40.0%	EUR	Alcohol-content specific	18.81	Tax * (ABV * 100) * Vol / 100,000	5.64
Estonia	Wine	750	13.5%	EUR	Volumetric specific	147.82	Tax * Vol / 100,000	1.11
Finland	Wine	750	12.0%	EUR	Volumetric specific	4.21	Tax * Vol / 1,000	3.16
Finland	Beer	330	4.6%	EUR	Alcohol-content specific	38.05	Tax * ABV * Vol / 1,000	0.58
Finland	Spirits	750	32.0%	EUR	Alcohol-content specific	50.35	Tax * ABV * Vol / 1,000	12.08
Germany	Wine	750	12.0%	EUR	Not applied	-	-	0.00
Germany	Beer	330	4.8%	EUR	Alcohol-content specific	0.79	Tax * (ABV * 100) * (1 / 0.4) * Vol / 100,000	0.03
Germany	Spirits	750	37.5%	EUR	Alcohol-content specific	1,303.00	Tax * ABV * Vol / 100,000	3.66
Ireland	Beer	330	4.3%	EUR	Alcohol-content specific	22.55	Tax * (ABV * 100) * Vol / 100,000	0.32
Ireland	Wine	750	12.5%	EUR	Volumetric specific	424.84	Tax * Vol / 100,000	3.19
Ireland	Spirits	750	37.5%	EUR	Alcohol-content specific	42.57	Tax * ABV * Vol / 1,000	11.97
Italy	Beer	330	4.7%	EUR	Alcohol-content specific	2.94	Tax * (ABV * 100) * (1 / 0.4) * Vol / 100,000	0.11
Italy	Spirits	750	11.0%	EUR	Alcohol-content specific	1,035.52	Tax * ABV * Vol / 100,000	0.85

Country	Beverage	Unit volume	ABV (%)	Currency	Excise tax type	Tax rate (LCU)	Tax calculation	Tax amount per unit (LCU)
Italy	Wine	750	10.5%	EUR	Not applied	-	-	0.00
Lithuania	Beer	330	5.2%	EUR	Alcohol-content specific	7.82	Tax * (ABV * 100) * Vol / 100,000	0.13
Lithuania	Spirits	750	40.0%	EUR	Alcohol-content specific	2,163.00	Tax * ABV * Vol / 100,000	6.49
Lithuania	Wine	750	13.0%	EUR	Volumetric specific	181.00	Tax * Vol / 100,000	1.36
Poland	Beer	330	6.0%	PLN	Alcohol-content specific	9.43	Tax * 12 * Vol / 100,000	0.37
Poland	Spirits	750	40.0%	PLN	Alcohol-content specific	6,903.00	Tax * ABV * Vol / 100,000	20.71
Poland	Wine	750	10.0%	PLN	Volumetric specific	191.00	Tax * Vol / 100,000	1.43
Portugal	Spirits	750	40.0%	EUR	Alcohol-content specific	1,400.80	Tax * ABV * Vol / 100,000	4.20
Portugal	Beer	330	5.0%	EUR	Volumetric specific	21.10	Tax * Vol / 100,000	0.07
Portugal	Wine	750	13.5%	EUR	Not applied	-	-	0.00
Romania	Beer	330	4.5%	RON	Alcohol-content specific	3.77	Tax * (ABV * 100) * (1 / 0.4) * Vol / 100,000	0.14
Romania	Spirits	750	40.0%	RON	Alcohol-content specific	3,778.89	Tax * ABV * Vol / 100,000	11.34
Romania	Wine	750	13.5%	RON	Not applied	-	-	0.00
Slovenia	Beer	330	4.9%	EUR	Alcohol-content specific	12.10	Tax * (ABV * 100) * Vol / 100,000	0.20
Slovenia	Spirits	750	35.0%	EUR	Alcohol-content specific	1,320.00	Tax * ABV * Vol / 100,000	3.47
Slovenia	Wine	750	12.0%	EUR	Not applied	-	-	0.00
Spain	Spirits	750	37.5%	EUR	Alcohol-content specific	958.94	Tax * ABV * Vol / 100,000	2.70
Spain	Beer	330	4.8%	EUR	Volumetric specific	7.48	Tax * Vol / 100,000	0.02
Spain	Wine	750	10.0%	EUR	Volumetric specific	0.00	Tax * Vol / 100,000	0.00
Sweden	Beer	330	5.3%	SEK	Alcohol-content specific	2.02	Tax * (ABV * 100) * Vol / 1,000	3.53
Sweden	Spirits	750	37.5%	SEK	Alcohol-content specific	516.59	Tax * ABV * Vol / 1,000	145.29
Sweden	Wine	750	12.0%	SEK	Volumetric specific	26.18	Tax * Vol / 1,000	19.64
United Kingdom	Beer	330	4.0%	GBP	Alcohol-content specific	19.08	Tax * ABV * Vol / 1,000	0.25
United Kingdom	Spirits	750	37.5%	GBP	Alcohol-content specific	28.74	Tax * ABV * Vol / 1,000	8.08
United Kingdom	Wine	750	11.0%	GBP	Volumetric specific	3.82	Tax * Vol / 1,000	2.86