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Alcohol excise taxes as a percentage of retail alcohol prices in 26 OECD countries

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ABSTRACT

Background: Many countries have implemented alcohol excise taxes. However, measures of excise taxes as a percentage of alcohol prices have not been systematically studied.
Methods: Data on the retail prices of alcoholic beverages sold in stores and excise taxes in 26 countries during 2003–2018 was from the Economist Intelligence Unit price city data and the Organization for Economic Co-operation and Development (OECD) tax database. The percentages of excise taxes in off-premise retail prices were derived as the ratio of taxes to prices at different price levels. Changes of excise taxes over time were assessed using negative binominal regressions.
Results: The percentage of excise taxes in average off-premise alcohol prices was from 5 % in Luxembourg to 59 % in Iceland for beer, and from 0 % in France to 26 % in Iceland for wine. Excise taxes accounted for 5% of discount liquor prices in Czech Republic to 41 % in Sweden for Cognac, for 19 % in the United States (US) to 67 % in Sweden for Gin, for 13 % in the US to 63 % in Australia for Scotch Whisky six years old, and for 6 % in Iceland to 76 % in Sweden for Liqueur Cointreau. There were no significant changes in the percentage of excise taxes in alcohol prices over time in most countries except for Nordic countries. While wine had the lowest excise taxes, liquors had the highest tax burden.
Conclusion: Tax burden on alcoholic beverages is low in OECD countries, indicating ample room for increasing alcohol excise taxes, particularly for beer and wine in those countries.

1. Introduction

Excessive alcohol use has been demonstrated by epidemiological research as a major cause of adverse health, economic, and behavior-related consequences internationally (Corrao et al., 2004; Parry et al., 2011; Stahre et al., 2014). These adverse effects led the World Health Organization (WHO) to create its 2010 "Global strategy to reduce the harmful use of alcohol" (WHO report, 2010), inspiring a number of countries to adopt policies aimed at addressing the epidemic, such as strong policies against drinking and driving, marketing restrictions, tax increases, minimum pricing policies, limits on availability of alcohol, and monitoring and surveillance (WHO report, 2014). Increasing taxes is considered the most effective intervention among alcohol policies aimed at reducing excessive drinking (Wagenaar et al., 2010, 2010; Xu and Chaloupka, 2011). Previous studies have shown that high-income countries with higher alcohol excise taxes tend to experience lower alcohol consumption, lower incidence of binge drinking, fewer alcohol-related traffic accidents, and lower mortality/sudden deaths from alcohol-related disease (Chaloupka et al., 1993; Koski et al., 2007; Wagenaar et al., 2009; Delcher et al., 2012; Xuan et al., 2015).

Excise taxes are taxes imposed on specific goods, services, and activities such as tobacco and alcohol, and they are often included in the

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product price (Kagan, 2020). Excise taxes as a percentage of retail prices that consumers pay at retail stores are considered as an indicator for tax burden and the effectiveness of tobacco taxes in reducing tobacco use (Sornpaisarn et al., 2017). Despite the implementation of alcohol excise taxes in many countries, excise taxes as a percentage of alcohol prices have not been systematically studied. To the best of our knowledge, only one study has examined the percentage of retail prices paid in taxes. Using the International Alcohol Control surveys collected from drinkers in Australia (2013), New Zealand (2011), St Kitts & Nevis (2014/2016), Thailand (2012), South Africa (2014), and Vietnam (2014), Wall et al. (2018) examined the average percentage of excise taxes in retail alcohol prices in those countries. The authors found that the percentage of excise taxes in retail alcohol prices changed widely across those countries (Wall et al., 2018). However, with only one data point for each country, the authors were not able to examine changes in the percentage of alcohol excise taxes in retail prices over time.

While the percentage of excise taxes in retail cigarette prices is an established policy target in tobacco control, that is not the case for alcohol excise taxes (Wall et al., 2018). In 2008, to assist party countries in implementing comprehensive tobacco control policies, the WHO introduced the MPOWER scores: M – monitoring tobacco use and prevention policies, P – protecting people from tobacco smoke, O – offering help to quit tobacco use, W – warning about the dangers of tobacco, E – enforcing bans on tobacco advertising, promotion and sponsorship, and R – raising taxes on tobacco (WHO Report, 2015). Each score was measured on a scale of 1–4/5, in which a score of 1 indicates missing data, and a score of 2–4/5 indicates the weakest to strongest policy implementation. Specifically, a score of 2–5 in R shows the percentage of cigarette excise taxes in retail prices: 2 – tax $<=$ 25 % of retail price, 3–26 %–50 % of retail price, 4 – 51 %–75 % of retail price, and 5 – >75 % of retail price (WHO Report, 2015). These scores are important measures that allow researchers to examine the effectiveness of those policies and provide guidelines for countries where more actions are needed (WHO Report, 2015). In 2011, the WHO also recommended 70 % of excise taxes in cigarette prices for effective tobacco control (WHO Technical Manual, 2011). Thus, further research is needed to systematically examine the percentage of excise taxes in alcohol prices to inform policy development and discussion for establishing a similar benchmark for alcohol taxes as a percentage of alcohol prices (Wall et al., 2018).

Due to the complexity in all existing tax regimes and regulatory arrangements arisen over time and in place, it is hard to compare alcohol excise taxes across countries (Wall et al., 2018). Moreover, different alcohol products may be taxed at different rates. For instance, compared to beer and wine, spirits tend to be taxed at a much higher rate (Osterberg, 2004). As a result, it would be more informative to examine the percentage of excise taxes in prices of each alcohol product over time to better depict the current situation of excise taxes.

Given the global burden of excessive alcohol use, our study contributes to the literature by providing insights on the percentage of excise taxes in retail alcohol prices over time and across countries. Unlike on-premise sales that vary significantly by locations, off-premise alcohol prices and taxes are routinely collected for many countries and offer a great opportunity to assess the magnitude of taxes and how that may vary by countries. Specifically, using Economist Intelligence Unit (EIU) city data on alcoholic beverage prices and OECD tax database on alcohol excise taxes in 26 OECD countries, we quantify excise taxes as a percentage of final retail prices of products sold off-premise (beer, wine, and liquor), and evaluate the trends of excise taxes as a percentage of prices during 2003–2018.

2. Material and methods

2.1. Data sources

The data on alcoholic beverage prices and alcoholic excise taxes were obtained from the Economist Intelligence Unit (EIU) price city data and OECD Tax database respectively.

2.1.1. Economist Intelligence Unit (EIU) city data

In this study, we used EIU price data from 2003 to 2018, the period when excise tax rates in OECD countries are available (OECD, 2020). The EIU alcoholic beverage price data were collected twice a year from supermarkets and mid-priced stores in 140 cities in 92 countries during the study period (EIU CityData, 2020). To ensure the consistency of data over time and across geographical locations, the EIU collected prices of the same or similar brands of each product. The EIU collected prices of one local brand beer and one top quality beer. Thus, we have four aggregated beer price points per year in each city (local brand from supermarkets, local brand from mid-priced stores, top quality from supermarkets, and top quality from mid-priced stores). Similarly, we have six aggregated wine price points (common table from supermarkets, common table from mid-priced stores, superior quality from supermarkets, superior quality from mid-priced stores, fine quality from supermarkets, and fine quality from mid-priced stores). For each subtype of liquor (Cognac - French VSOP, Gin - Gilbey's or equivalent, Liqueur Cointreau, and Scotch whisky - six years old), we have two aggregated price points per year in each city, with one from supermarkets and the other one from mid-priced stores.

2.1.2. OECD tax database

The information on OECD taxes was gathered from *Consumption Tax Trends* reports published by OECD Tax database. The reports included information on the Value Added Taxes (VATs) imposed on goods, and excise taxes of various alcoholic beverages as of January 1 of the report year. Thus, January 1 tax rates were used for years 2003, 2005, 2007, 2009, 2012, 2014, 2016, and 2018. To make excise taxes comparable, the reports standardized tax bases across countries, in which tax rates were calculated as the average of federal and local taxes weighted by population in the US where state taxes exist.

Consumption Tax Trends reports measured beer excise taxes on a basis of per hectoliter per % abv (percentage of pure alcohol by volume at 20℃). The reports also measured excise taxes of sparkling and still wine on a basis of per hectoliter, and excise taxes of other alcoholic beverages on a basis of per hectoliter of absolute alcohol. Beer taxes were scaled to rates per liter of 5% abv products to match those tax rates with price data. Similarly, wine taxes were scaled to rates per 750 mL bottle, and liquor taxes were scaled to rates per 700 mL of 40 % abv products. Since it is unclear whether the EIU surveyed sparkling or still wine products, we used the average wine tax rates for our data analyses.

To compile the final analytical sample, we linked alcoholic beverage price data and alcohol excise taxes data using year and country identifiers. Among 36 OECD countries, 26 countries included in the sample are Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom, and United States. Countries with no excise taxes or countries with local taxes not accounted for were excluded from the sample. Countries with missing information on alcoholic beverage prices and taxes were also excluded.

2.2. Measures

We measured alcoholic beverage prices in constant 2010 US dollars using each country's own consumer price index (CPI) and converting prices into 2010 US dollars. For each country, the percentage of excise taxes in prices was calculated as a ratio of excise taxes to prices at three different price levels: maximum price, mean price, and minimum price for beer and wine, and at two different price levels: high end and low end for liquors. Fractional logit regressions were used to examine the trends of these percentage measures over time. All analyses were conducted using Stata 16.

3. Results

Table 1 shows the percentages of excise taxes in final beer retail prices in 26 OECD countries and results of trend analyses duing 2003-2018. Excise taxes contribute the most to final beer retail prices at the minimum level and the least at the maximum level. Luxembourg has the lowest percentages of excise taxes at three different price levels while Iceland has the highest percentages of excise taxes in all price levels. The percentages of excise taxes at the minimum level range from 5.0 % to 59 %. At the mean level, the percentages of excise taxes are from 4.0 % to 51 %. At the maximum level, excise taxes account for 3.9 %–49 % of final retail prices. Although the trend analyses indicate changes in the percentages of excise taxes over time in such countries as Australia, Denmark, Germany, Ireland, Japan, and others, these changes are very small and unnoticeable except for Iceland.

Fig. 1 presents the trends of excise taxes as a percentage of final beer retail prices at three different price levels during 2003–2018. The percentages of excise taxes in beer prices at the maximum and average price levels are less than 10 % and stay the same in most countries during the study period. The percentages of excise taxes are less than 1 % at all three different price levels in France, Japan, Poland, and the United States. The percentages of excise taxes are highest at the minimum price level in all countries and do not change much over time except for Iceland, Ireland, and Netherlands.

Table 2 displays the percentages of excise taxes in final wine retail prices at three different price levels during 2003–2018. Excise taxes account for the largest amount of wine prices at the minimum level and the smallest amount at the maximum level. France has the lowest percentages of excise taxes of approximately 0% at three different price levels while Iceland has the highest percentages of excise taxes. At the minimum level, excise taxes account for 53 % of prices in Iceland and 2% in France. At the average level, the percentages of excise taxes range from 0% in France to 26 % in Iceland. At the maximum level, the percentages of excise taxes are from 0 % to 15 % of final prices. The estimates of the trend analyses suggest that the percentages of excise taxes increased over time in Czech Republic, Ireland, and Norway, and decreased in Austria, Germany, Slovak Republic, and the United States. In other countries, the percentages of excise taxes stayed the same during the study period.

Fig. 2 presents trends of excise taxes as a percentage of wine prices during 2003–2018. The percentages of excise taxes in wine prices are stable over time in most countries, except for Iceland and Ireland. There are large variations in the percentages of excise taxes across countries. While in France, Japan, Poland, and the Unites States, excise taxes account for 1% of wine prices, they contribute to 40 %–60 % of prices in Finland, Iceland, Ireland, Norway, and the United Kingdom during the study period. There are large differences in the percentage of excise taxes across different price levels in Finland, Iceland, Ireland, Netherlands, Norway, Slovak Republic, Sweden and the United Kingdom.

Table 3 shows the percentages of excise taxes in cognac and gin prices at three different price levels during 2003–2018. The percentages of excise taxes in cognac prices at the high-end range from 5% in Czech Republic and Spain to 38 % in Norway. At the low end, excise taxes account for 5% of cognac prices in Czech Republic to 41 % in Sweden. For gin, the percentages of excise taxes range from 16 % in the United States to 60 % in Norway at the high end. At the low end, excise taxes contribute to 19 % in the United States to 67 % in Sweden. Over time, the percentages of excise taxes in final cognac retail prices increased slightly in Australia, Belgium, Czech Republic, Greece, New Zealand, Norway, Poland, Portugal, Slovak Republic, and Switzerland, and decreased in Denmark, Germany, Luxembourg, and Spain. Iceland experienced the largest increases in the percentages of excise taxes in both gin and cognac prices.

The percentages of excise taxes in scotch and liqueur retail prices are shown in Table 4. Excise taxes account for 11 % in the United States to 56 % in Australia at the high end. At the low end, the percentages of excise taxes range from 13 % in the United States to 63 % in Australia. For liqueur, excise taxes contribute to 6% of final retail prices in Iceland to 76 % in Sweden at the high end. Similarly, the percentages of excise taxes in final liqueur retail prices range from 6% in Iceland to 76 % in Sweden at the low end. The trend analyses suggest that Ireland experienced the largest increases in the percentages of excise taxes in scotch prices. Although the estimates suggest changes in the percentages of

Table 1
Excise Taxes as Percentages of Final Beer Retail Prices by Countries.

Price Level	% of Max Price		% of Mean Price		% of Min Price	
Countries	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β (SE)	Mean (SD)	Trend β (SE)
Australia	0.19 (0.01)	0.02***(0.00)	0.25 (0.01)	0.00* (0.00)	0.35 (0.05)	−0.03* (0.01)
Austria	0.07 (0.01)	−0.02***(0.00)	0.09 (0.01)	0.00 (0.00)	0.13 (0.02)	0.01^{+} (0.01)
Belgium	0.05 (0.00)	0.01(0.003)	0.07 (0.00)	0.01* (0.00)	0.11 (0.01)	0.01** (0.00)
Czech Republic	0.07 (0.02)	−0.01(0.02)	0.08 (0.02)	−0.02 (0.02)	0.09 (0.03)	−0.03 (0.02)
Denmark	0.11 (0.06)	−0.11***(0.01)	0.13 (0.05)	−0.08***(0.01)	0.14 (0.04)	−0.06*** (0.01)
Finland	0.19 (0.04)	−0.05***(0.01)	0.24 (0.02)	−0.01^{+}(0.01)	0.32 (0.06)	0.04** (0.01)
France	0.05 (0.02)	0.04 (0.03)	0.07 (0.03)	0.04^{+} (0.02)	0.10 (0.04)	0.04 (0.02)
Germany	0.04 (0.01)	−0.03***(0.00)	0.05 (0.01)	−0.03*** (0.00)	0.07 (0.01)	−0.04*** (0.00)
Greece	0.10 (0.05)	0.09***(0.01)	0.11 (0.05)	0.09***(0.01)	0.12 (0.06)	0.09*** (0.02)
Hungary	0.14 (0.02)	0.01(0.01)	0.17 (0.01)	0.002 (0.01)	0.21 (0.01)	−0.01 (0.01)
Iceland	0.50 (0.18)	−0.13***(0.02)	0.51 (0.18)	−0.13***(0.02)	0.59 (0.18)	−0.14***(0.02)
Ireland	0.24 (0.02)	0.01 (0.01)	0.26 (0.02)	−0.01 (0.00)	0.30 (0.02)	−0.01* (0.01)
Italy	0.10 (0.02)	0.01 (0.01)	0.12 (0.02)	0.01 (0.01)	0.16 (0.04)	0.003 (0.02)
Japan	0.29 (0.02)	−0.02***(0.00)	0.35 (0.01)	−0.01 (0.00)	0.42 (0.02)	−0.01* (0.00)
Luxembourg	0.04 (0.00)	0.00(0.00)	0.04 (0.00)	−0.01*(0.00)	0.05 (0.00)	−0.02** (0.01)
Netherlands	0.09 (0.01)	0.01 (0.01)	0.11 (0.01)	0.005(0.00)	0.17 (0.03)	−0.01 (0.01)
New Zealand	0.17 (0.02)	0.02* (0.01)	0.22 (0.02)	0.01*(0.01)	0.29 (0.02)	0.01 (0.00)
Norway	0.23 (0.04)	0.02 (0.01)	0.33 (0.05)	−0.00 (0.01)	0.49 (0.07)	−0.02 (0.02)
Poland	0.09 (0.03)	0.07***(0.01)	0.12 (0.03)	0.04***(0.01)	0.18 (0.02)	−0.01 (0.01)
Portugal	0.07 (0.01)	−0.02^{+} (0.01)	0.09 (0.01)	−0.02***(0.00)	0.12 (0.02)	−0.04*** (0.01)
Slovak Republic	0.11 (0.02)	−0.05*** (0.01)	0.14 (0.03)	−0.05*** (0.01)	0.19 (0.04)	−0.04*** (0.01)
Spain	0.05 (0.00)	0.00 (0.00)	0.06 (0.00)	−0.00(0.00)	0.07 (0.00)	−0.002 (0.00)
Sweden	0.22 (0.01)	−0.00^{+}(0.00)	0.25 (0.01)	0.01(0.00)	0.29 (0.03)	0.02** (0.01)
Switzerland	0.07 (0.04)	−0.11***(0.02)	0.08 (0.05)	−0.09***(0.02)	0.10 (0.05)	−0.08*** (0.02)
United Kingdom	0.22 (0.01)	0.00 (0.01)	0.29 (0.03)	0.00 (0.00)	0.39 (0.08)	−0.01 (0.02)
United States	0.23 (0.02)	−0.02***(0.00)	0.28 (0.03)	−0.03***(0.00)	0.28 (0.03)	−0.04***(0.00)

Note: SD: standard deviations. SE: Standard Errors. $+p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Trend: changes over time (decrease (−) or increase (+)).

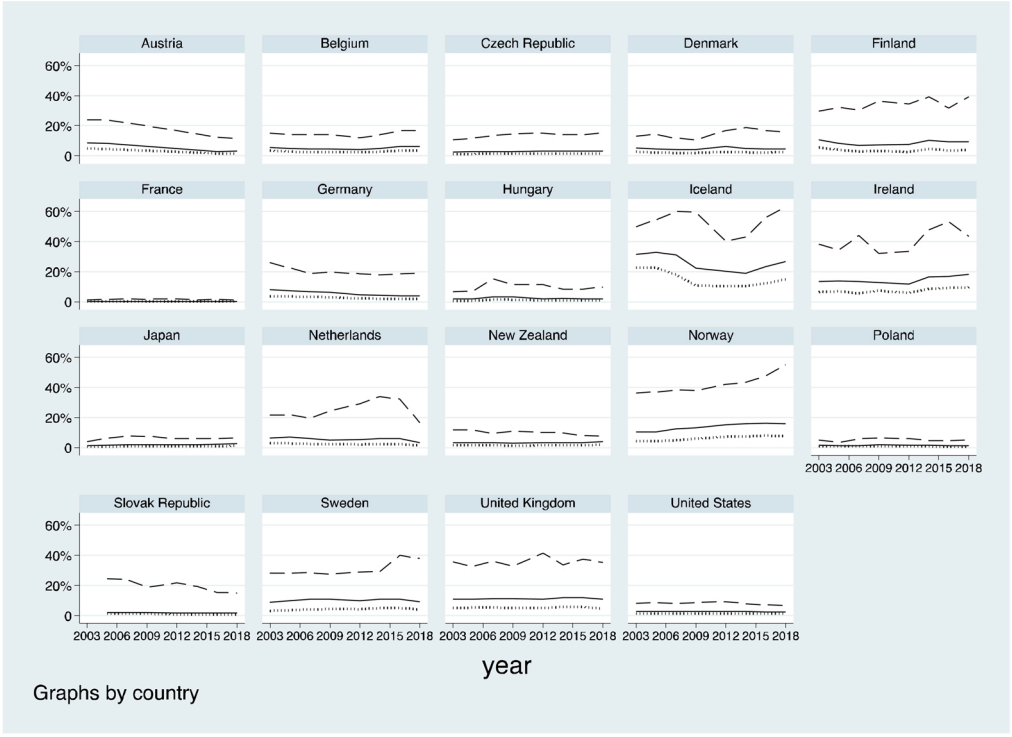

Fig. 1. Excise Beer Taxes as Percentages of Prices by Countries, 2003–2018.

Table 2
Excise Taxes as Percentages of Final Wine Retail Prices by Countries.

Price level	% of max price		% of mean price		% of min price	
Countries	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)
Austria	0.03 (0.02)	−0.08***(0.01)	0.06 (0.03)	−0.08***(0.01)	0.18 (0.07)	−0.06***(0.00)
Belgium	0.03 (0.01)	0.01(0.01)	0.05 (0.01)	0.01(0.01)	0.15 (0.02)	0.01 (0.01)
Czech Republic	0.01 (0.00)	0.01***(0.00)	0.03 (0.00)	0.01***(0.00)	0.14 (0.02)	0.02***(0.01)
Denmark	0.02 (0.00)	0.01(0.01)	0.05 (0.01)	−0.00(0.01)	0.15 (0.03)	0.03**(0.01)
Finland	0.04 (0.01)	−0.01(0.02)	0.09 (0.01)	0.01(0.01)	0.34 (0.04)	0.02**(0.01)
France	0.00 (0.00)	−0.01(0.01)	0.00 (0.00)	−0.00(0.01)	0.02 (0.00)	−0.01(0.01)
Germany	0.03 (0.01)	−0.05***(0.00)	0.06 (0.02)	−0.06***(0.00)	0.20 (0.03)	−0.02**(0.01)
Hungary	0.01 (0.00)	0.00(0.02)	0.02 (0.01)	−0.01(0.02)	0.10 (0.03)	0.00(0.02)
Iceland	0.15 (0.05)	−0.06(0.02)	0.26 (0.05)	−0.03*(0.02)	0.53 (0.08)	0.00(0.02)
Ireland	0.07 (0.02)	0.03***(0.01)	0.15 (0.02)	0.02***(0.01)	0.41 (0.08)	0.03*(0.01)
Japan	0.01 (0.00)	0.04***(0.01)	0.02 (0.00)	0.04***(0.01)	0.06 (0.01)	0.01(0.01)
Netherlands	0.02 (0.01)	−0.03*(0.01)	0.06 (0.01)	−0.03^{+}(0.01)	0.25 (0.06)	0.02(0.03)
New Zealand	0.02 (0.00)	0.01(0.01)	0.03 (0.00)	0.01(0.01)	0.10 (0.01)	−0.03***(0.00)
Norway	0.06 (0.02)	0.05***(0.01)	0.14 (0.02)	0.04***(0.01)	0.42 (0.06)	0.05***(0.01)
Poland	0.01 (0.00)	−0.03***(0.01)	0.02 (0.00)	−0.00(0.01)	0.05 (0.01)	0.00(0.01)
Slovak Republic	0.01 (0.00)	−0.06***(0.01)	0.02 (0.00)	−0.03***(0.00)	0.20 (0.04)	−0.05***(0.01)
Sweden	0.04 (0.01)	0.02*(0.01)	0.10 (0.01)	0.01(0.01)	0.31 (0.05)	0.03***(0.01)
United Kingdom	0.05 (0.00)	0.00(0.01)	0.11 (0.01)	0.00(0.00)	0.36 (0.03)	0.01(0.01)
United States	0.01 (0.00)	−0.01***(0.00)	0.03 (0.00)	−0.01***(0.00)	0.08 (0.01)	−0.01*(0.01)

Note: SD: Standard Deviations. SE: Standard Errors. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001. Trend: changes over time (decrease (−) or increase (+)).

excise taxes in scotch and liqueur retail prices over time in other countries, these changes are small and unnoticeable.

Figs. 3 and 4 show the trends of excise taxes as a percentage of gin and cognac prices at three different price levels across countries during 2003–2018. Figs. 5 and 6 present the trends of excise taxes as a percentage of scotch and liqueur prices at three different price levels across countries during 2003–2018. Overall, there are no significant differences in the percentages of excise taxes across different types of liquors and different price levels. Excise taxes do not change much over time in most countries except for Iceland. Iceland experienced significant increases in the percentages of excise taxes in gin, cognac, and scotch prices during 2008−2011.

4. Discussion

In this study, we quantify excise taxes as a percentage of alcoholic beverage prices (beer, wine, and liquor) in 26 OECD countries, and evaluate the trends of taxes as a percentage of prices during 2003–2018. Our results suggest wide variations in the percentages of excise taxes in prices of all alcohol products sold off-premise across countries. In

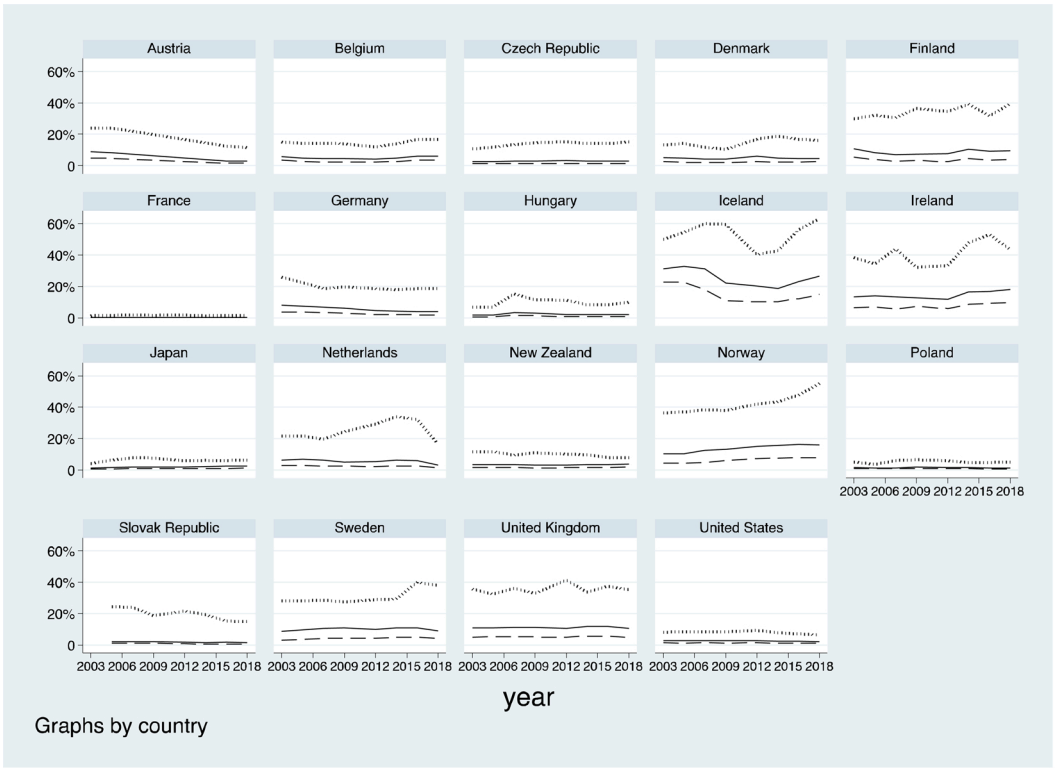

Fig. 2. Excise Wine Taxes as Percentages of Prices by Countries, 2003–2018.

Table 3
Excise Taxes as Percentages of Cognac/Gin Retail Prices by Countries.

Price level	High cognac price		Low cognac price		High gin price		Low gin price	
Countries	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)
Australia	0.24 (0.02)	0.02***(0.00)	0.26 (0.02)	0.02***(0.00)	0.57 (0.04)	−0.01(0.01)	0.62 (0.04)	−0.01(0.01)
Austria	0.08 (0.01)	0.01^{+}(0.00)	0.09 (0.01)	0.01(0.01)	0.18 (0.03)	0.03**(0.01)	0.21 (0.02)	0.01(0.01)
Belgium	0.28 (0.05)	0.04***(0.01)	0.32 (0.03)	0.02*(0.01)	0.48 (0.06)	0.03**(0.01)	0.51 (0.06)	0.02(0.01)
Czech Republic	0.05 (0.01)	0.02***(0.00)	0.05 (0.01)	0.02***(0.00)	0.23 (0.01)	−0.00(0.01)	0.23 (0.01)	−0.00(0.01)
Denmark	0.14 (0.02)	−0.02***(0.01)	0.31 (0.05)	−0.02^{+}(0.01)	0.29 (0.09)	−0.06***(0.01)	0.37 (0.06)	−0.02(0.01)
Finland	0.23 (0.02)	0.00(0.01)	0.16 (0.02)	0.03***(0.01)	0.41 (0.07)	0.06***(0.00)	0.58 (0.11)	0.07***(0.02)
France	0.13 (0.01)	0.00(0.00)	0.16 (0.02)	0.01(0.01)	0.35 (0.05)	−0.04***(0.01)	0.42 (0.03)	−0.00(0.01)
Germany	0.11 (0.02)	−0.03***(0.00)	0.14 (0.02)	−0.03***(0.00)	0.26 (0.05)	−0.05***(0.00)	0.31 (0.04)	−0.03***(0.01)
Greece	0.14 (0.05)	0.07***(0.01)	0.15 (0.05)	0.07***(0.01)	0.37 (0.07)	0.05***(0.01)	0.37 (0.07)	0.05***(0.01)
Hungary	0.08 (0.01)	0.01(0.01)	0.09 (0.01)	0.02**(0.01)	0.18 (0.03)	0.01(0.01)	0.22 (0.02)	−0.01(0.01)
Iceland	0.20 (0.18)	0.23***(0.03)	0.27 (0.25)	0.23***(0.05)	0.36 (0.32)	0.30***(0.05)	0.34 (0.30)	0.32***(0.05)
Ireland	0.28 (0.06)	−0.02(0.02)	0.35 (0.06)	−0.01(0.02)	0.48 (0.07)	−0.05***(0.01)	0.49 (0.06)	−0.04*(0.02)
Italy	0.14 (0.01)	0.01(0.01)	0.15 (0.01)	0.01*(0.01)	0.27 (0.02)	0.02**(0.00)	0.34 (0.07)	0.05***(0.01)
Luxembourg	0.13 (0.03)	−0.05***(0.01)	0.15 (0.05)	−0.06***(0.01)	0.33 (0.02)	−0.01(0.01)	0.35 (0.03)	−0.01(0.01)
Netherlands	0.13 (0.01)	−0.00(0.01)	0.15 (0.02)	0.02*(0.01)	0.29 (0.03)	−0.02***(0.00)	0.31 (0.03)	−0.02**(0.01)
New Zealand	0.12 (0.02)	0.03**(0.01)	0.14 (0.04)	0.04***(0.01)	0.42 (0.02)	0.00(0.00)	0.47 (0.01)	0.00(0.00)
Norway	0.38 (0.02)	0.01**(0.00)	0.39 (0.02)	0.01**(0.00)	0.60 (0.02)	0.00(0.00)	0.63 (0.03)	0.00(0.01)
Poland	0.07 (0.03)	0.10***(0.01)	0.10 (0.05)	0.10***(0.02)	0.22 (0.06)	0.06***(0.01)	0.30 (0.08)	0.07***(0.01)
Portugal	0.11 (0.04)	0.07***(0.01)	0.12 (0.03)	0.04**(0.01)	0.28 (0.03)	−0.01(0.01)	0.29 (0.03)	−0.01(0.01)
Slovak Republic	0.06 (0.02)	0.06***(0.01)	0.07 (0.02)	0.05***(0.01)	0.19 (0.01)	0.02**(0.00)	0.21 (0.03)	0.03***(0.01)
Spain	0.05 (0.02)	−0.07***(0.01)	0.05 (0.02)	−0.05***(0.01)	0.20 (0.01)	−0.01(0.01)	0.20 (0.01)	−0.00(0.00)
Sweden	0.31 (0.02)	−0.01***(0.00)	0.41 (0.01)	−0.00**(0.00)	0.54 (0.03)	0.02***(0.00)	0.67 (0.02)	0.01***(0.00)
Switzerland	0.18 (0.02)	0.02***(0.01)	0.20 (0.02)	0.02***(0.01)	0.40 (0.04)	0.02*(0.01)	0.47 (0.06)	0.04***(0.01)
United Kingdom	0.25 (0.04)	0.02**(0.01)	0.31 (0.05)	0.01(0.01)	0.44 (0.03)	−0.01(0.01)	0.52 (0.05)	0.02^{+}(0.01)
United States	0.07 (0.00)	0.003(0.00)	0.08 (0.00)	0.003(0.00)	0.16 (0.02)	−0.03***(0.00)	0.19 (0.03)	−0.04***(0.00)

Note: SD: Standard deviations. SE: Standard errors. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Trend: changes over time (decrease (−) or increase (+)).

addition, the tax burden on liquor is higher than the tax burden on beer and wine, with wine bearing the lowest tax burden.

Our results further indicate that in most OECD countries, the tax burden on beer and wine measured as a percentage of prices is lower than 30 %. For instance, 23 (~ 89 %) out of 26 OECD countries had excise taxes that accounted for ≤ 25 % of beer prices at the maximum level. The rest (3 countries) had a percentage of excise taxes that accounted for 29%–50% of prices. Similarly, in 19 out of 20 countries, excise taxes accounted for ≤ 25 % of average wine prices. In addition, in most countries, taxes as a percentage of prices did not change

Table 4
Excise Taxes as Percentages of Final Scotch/Liqueur Retail Prices by Countries.

Price Level	High Scotch price		Low Scotch Price		High Liqueur price		Low Liqueur price	
Countries	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)	Mean (SD)	Trend β(SE)
Australia	0.56 (0.03)	−0.01^{+}(0.01)	0.63 (0.05)	−0.01(0.01)	0.38 (0.01)	0.00(0.00)	0.41 (0.02)	0.01***(0.00)
Austria	0.15 (0.04)	0.06***(0.01)	0.17 (0.04)	0.06***(0.00)	0.15 (0.01)	0.00(0.00)	0.18 (0.01)	−0.00(0.00)
Belgium	0.39 (0.06)	0.04***(0.01)	0.44 (0.06)	0.05***(0.01)	0.32 (0.05)	0.03**(0.01)	0.33 (0.05)	0.03*(0.01)
Czech Republic	0.17 (0.01)	0.01**(0.00)	0.17 (0.01)	0.01^{+}(0.00)	0.12 (0.02)	0.04***(0.01)	0.13 (0.02)	0.03***(0.007)
Denmark	0.22 (0.07)	−0.07***(0.01)	0.32 (0.06)	−0.00(0.02)	0.26 (0.06)	−0.00(0.01)	0.35 (0.09)	0.01(0.03)
Finland	0.28 (0.03)	0.03***(0.01)	0.39 (0.07)	0.05***(0.01)	0.30 (0.05)	0.04***(0.00)	0.34 (0.04)	0.04***(0.00)
France	0.27 (0.02)	−0.00(0.01)	0.32 (0.02)	−0.00(0.01)	0.23 (0.01)	0.01(0.00)	0.27 (0.02)	0.01(0.01)
Germany	0.20 (0.04)	−0.04***(0.00)	0.25 (0.02)	−0.01**(0.005)	0.21 (0.01)	−0.01*(0.00)	0.25 (0.01)	0.01*(0.00)
Greece	0.31 (0.08)	0.06***(0.01)	0.32 (0.08)	0.06***(0.01)	0.27 (0.07)	0.06***(0.01)	0.27 (0.07)	0.06***(0.01)
Hungary	0.15 (0.06)	0.10***(0.01)	0.21 (0.04)	0.03^{+}(0.02)	0.13 (0.03)	−0.03(0.02)	0.17 (0.04)	−0.05***(0.01)
Iceland	0.32 (0.29)	0.29***(0.04)	0.39 (0.36)	0.38***(0.06)	0.05 (0.01)	−0.08**(0.02)	0.06 (0.01)	−0.06(0.05)
Ireland	0.43 (0.02)	−0.006(0.00)	0.49 (0.06)	−0.01(0.02)	0.40 (0.03)	−0.01^{+}(0.01)	0.53 (0.09)	0.01(0.02)
Italy	0.21 (0.02)	−0.01(0.01)	0.22 (0.02)	−0.00(0.01)	0.19 (0.02)	0.01**(0.00)	0.20 (0.02)	0.02**(0.006)
Luxembourg	0.26 (0.02)	−0.01(0.01)	0.27 (0.02)	−0.01*(0.00)	0.22 (0.02)	−0.02***(0.00)	0.23 (0.02)	−0.02***(0.00)
Netherlands	0.25 (0.04)	−0.03***(0.01)	0.27 (0.04)	−0.02*(0.01)	0.22 (0.03)	−0.03**(0.01)	0.23 (0.02)	−0.02*(0.01)
New Zealand	0.38 (0.03)	0.02***(0.00)	0.42 (0.04)	0.02**(0.01)	0.23 (0.02)	0.02***(0.00)	0.27 (0.04)	0.04***(0.00)
Norway	0.54 (0.03)	0.01(0.01)	0.59 (0.09)	0.05*(0.02)	0.53 (0.09)	0.05*(0.02)	0.59 (0.10)	−0.00(0.03)
Poland	0.21 (0.08)	0.08***(0.01)	0.25 (0.09)	0.08***(0.01)	0.18 (0.05)	0.05***(0.01)	0.20 (0.06)	0.05**(0.02)
Portugal	0.24 (0.02)	0.02**(0.01)	0.25 (0.02)	0.02***(0.00)	0.17 (0.01)	0.01***(0.00)	0.18 (0.02)	0.02**(0.006)
Slovak Republic	0.16 (0.02)	0.01(0.01)	0.18 (0.02)	0.02^{+}(0.01)	0.11 (0.02)	0.03***(0.01)	0.12 (0.02)	0.04***(0.005)
Spain	0.20 (0.01)	−0.00(0.00)	0.21 (0.01)	0.00(0.00)	0.17 (0.01)	0.01^{+}(0.00)	0.17 (0.01)	0.01*(0.00)
Sweden	0.39 (0.02)	0.00(0.00)	0.51 (0.08)	0.05***(0.01)	0.63 (0.09)	−0.05**(0.02)	0.76 (0.06)	−0.04*(0.02)
Switzerland	0.34 (0.07)	0.05***(0.01)	0.40 (0.04)	0.02*(0.01)	0.27 (0.02)	0.01(0.01)	0.30 (0.02)	0.01^{+}(0.007)
United Kingdom	0.32 (0.07)	−0.04**(0.01)	0.40 (0.04)	−0.02*(0.01)	0.41 (0.08)	0.06***(0.01)	0.52 (0.14)	0.10***(0.01)
United States	0.11 (0.01)	−0.02***(0.00)	0.13 (0.01)	−0.02***(0.00)	0.08 (0.00)	0.01***(0.00)	0.10 (0.01)	0.01***(0.00)

Note: SD: Standard deviations. SE: Standard errors. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Trend: changes over time (decrease (−) or increase (+)).

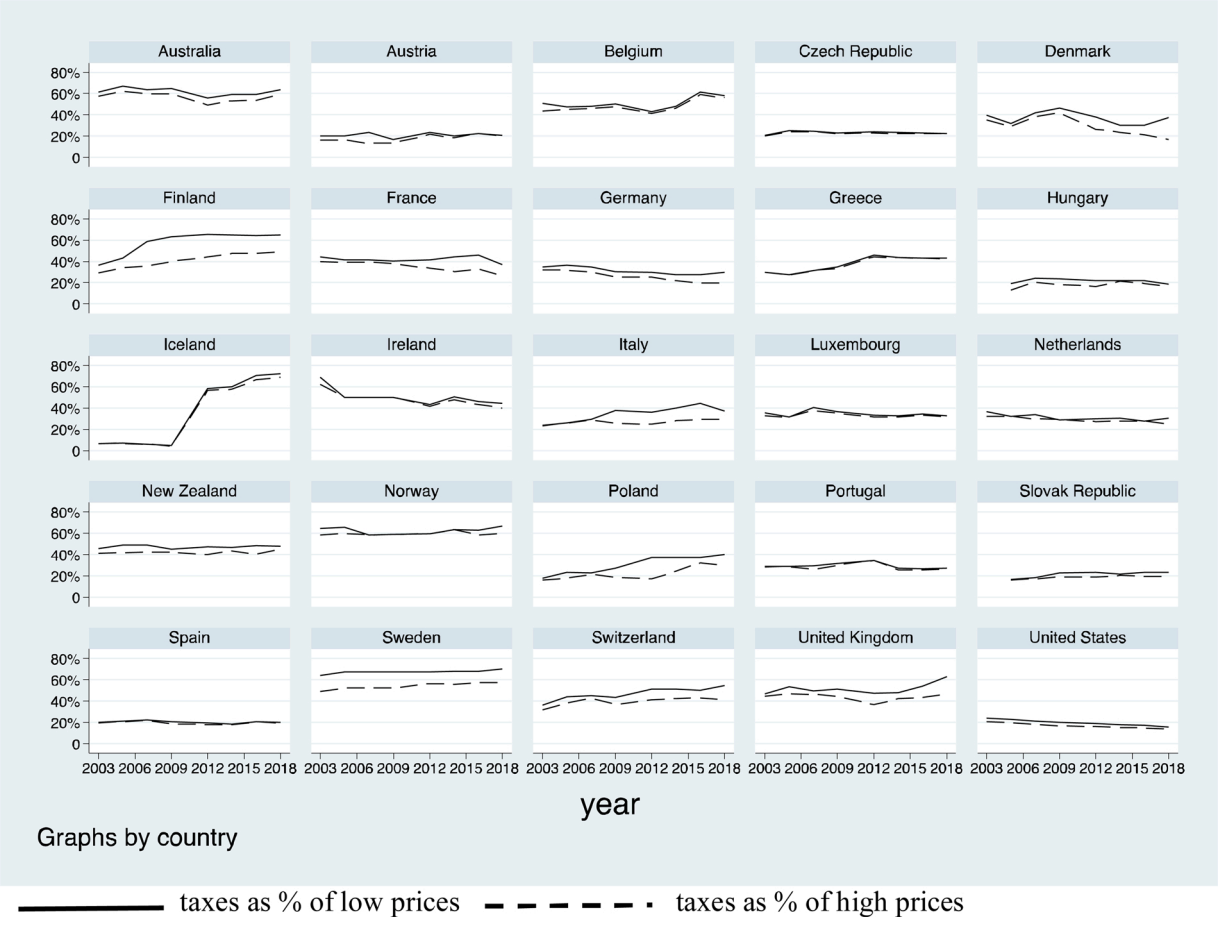

Fig. 3. Excise Liquor Taxes as Percentages of Retail Gin Prices by Countries, 2003–2018.

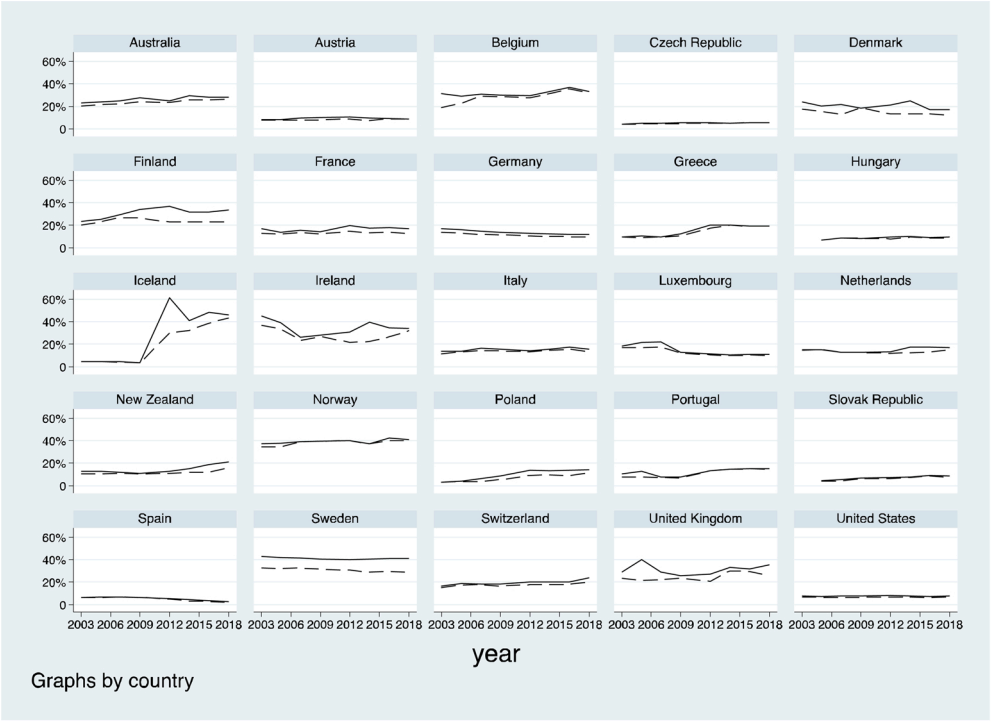

Fig. 4. Excise Liquor Taxes as Percentages of Retail Cognac Prices by Countries, 2003–2018.

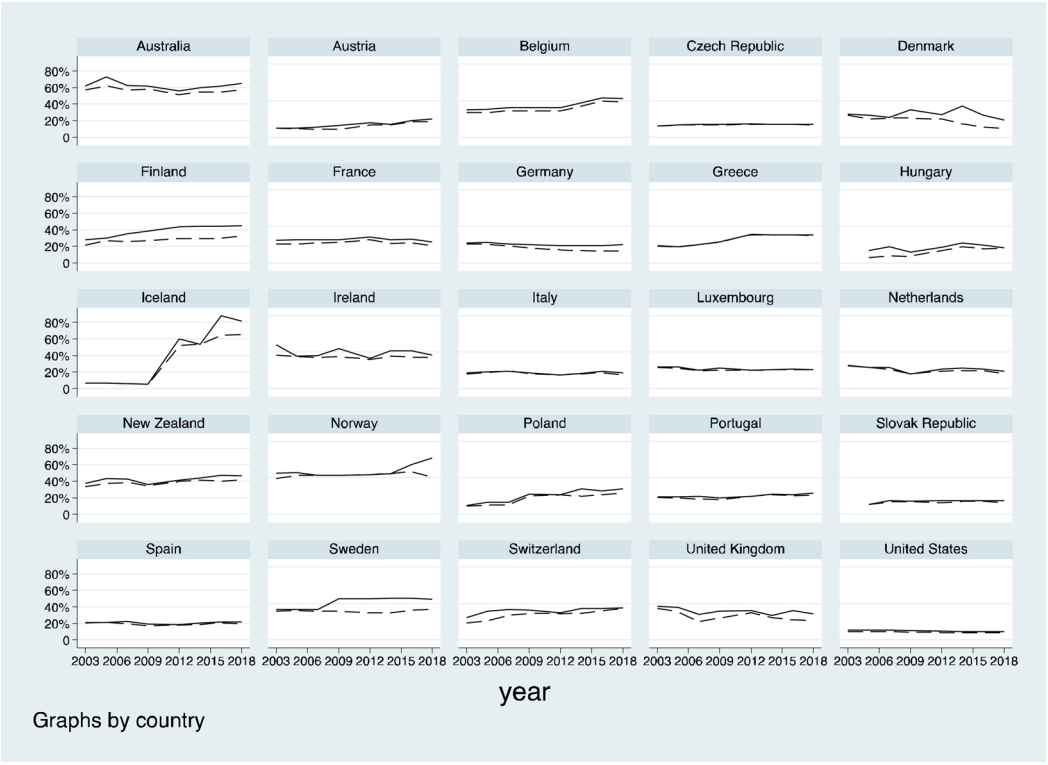

Fig. 5. Excise Liquor Taxes as Percentages of Retail Scotch Prices by Countries, 2003–2018.

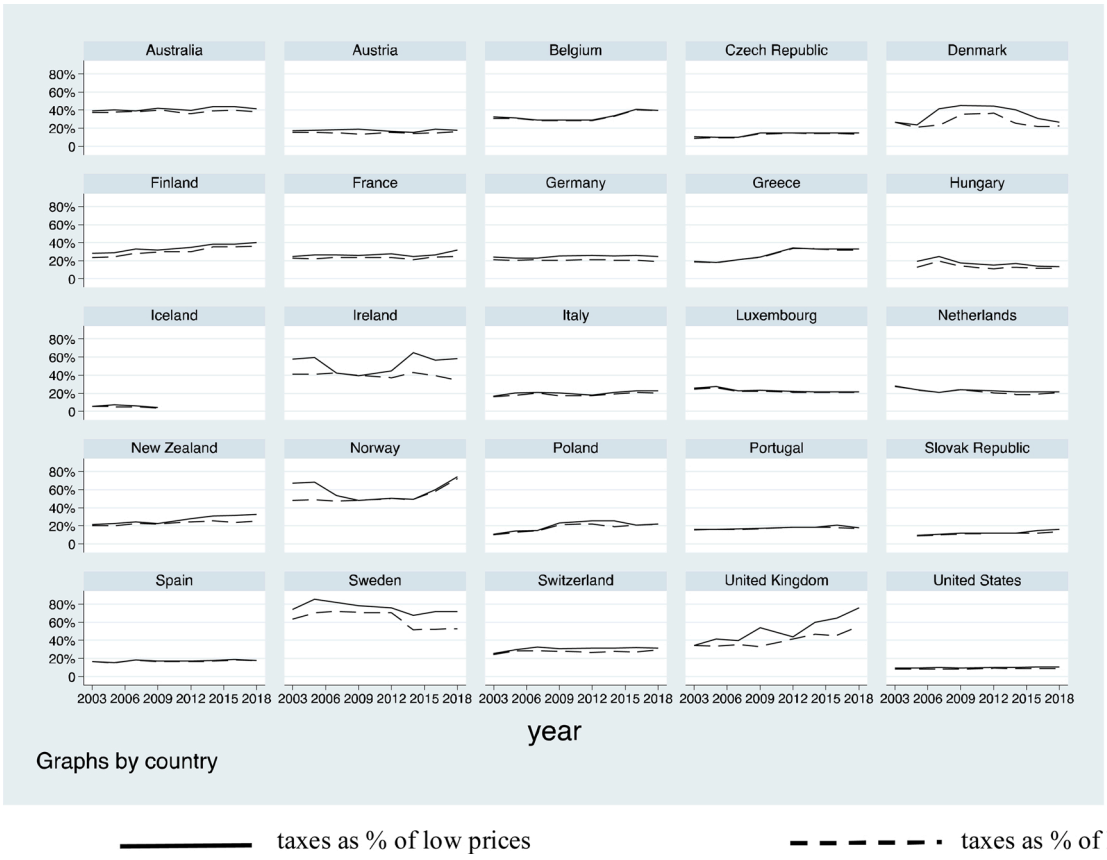

Fig. 6. Excise Liquor Taxes as Percentages of Retail Liqueur Prices by Countries, 2003–2018.

significantly over time, with the only exception of Nordic countries where the percentage of taxes for wine and liquor increased and the percentage of taxes for beer decreased over time.

Compared to cigarette taxes, the tax burden on alcoholic beverages is much lower in OECD countries, if not to say, fall short of the recommendation of 70 % of excise taxes in cigarette prices suggested by the WHO for effective tobacco control. In 2015, while 35 % of high-income countries met the target, 10 % of middle-income and approximately 3% of low-income countries had cigarette taxes at or above 70 % of final prices (WHO Technical Manual, 2011). On the other hand, during 2003–2018, our findings show that no OECD countries had excise taxes accounted for more than 70 % of beer and wine prices. Only one country (Sweden) had excise taxes contributed to 76 % of liqueur price at the low end. These results indicate that there is ample room for increasing alcohol excise taxes, particularly for beer and wine. The results also are consistent with the findings of a recent study that examines the percentage of alcohol taxes in prices in six high-income and middle-income countries (Wall et al., 2018).

Given that we assess the alcohol tax burdens in countries that impose alcohol excise taxes based on volume or quantities (i.e., specific taxes), the tax burden is higher for lower-priced products than for the higher-priced products. This type of specific taxes reduces price variability and potential opportunities for tax avoidance and is considered being particularly effective in reducing the consumption of lower-price products. (Shang et al., 2018) However, as this study shows, specific taxes are likely eroded by inflation over time (e.g., in the US) unless the tax rates are raised periodically to keep up with the inflation. Alternatively, in places where taxes are based on prices or values (i.e., ad valorem), tax burden is similar across price tiers and remains stable over time by adjusting with inflation. As such, ad valorem taxes keep lower-priced products affordable and may reduce the effectiveness of tax policies in reducing consumption. This weakness is stressed by the higher consumption of mid- and low- priced products as compared to high-priced products in countries like the US. As the 2019 Euromonitor data illustrate, the annual sales volume of mid- and low- priced lager in the US was 8,907 and 4,714 million liters respectively, whereas the sales volume of premium lager was 6,615 million liters (Euromintor, 2020), Policy makers may need to weigh pros and cons of tax bases when choosing the effective tax policies for alcohol products.

Our findings complement recent research indicating substantial worldwide increases in the affordability of beer over time – a measure which indicates how prices are changing relative to income (Blecher et al., 2018), which raises public health concerns and recommends increases in excise taxes to address this issue. Although Blecher et al. (2018) acknowledge that increased beer affordability may be more attributable to increased income and economic growth than to reductions in price, it is also important to note that raising excise taxes represents the most effective policy measure available to reduce the affordability of and demand for alcohol. Our present study contributes further to the literature by examining taxes as a share of all alcohol prices including wine and spirits– a different but a related construct, underscoring the fact that there is ample room to increase excise taxes on the full range of alcohol products. Such measures have been shown to reduce alcohol consumption and a wide range of prevalent alcohol-related problems/health outcomes (Wagenaar et al., 2009, 2010; Xu and Chaloupka, 2011), and thus have potential to make important contributions to public health.

Our study has some limitations. First, the EIU data surveyed alcohol prices in major cities in 92 countries. As a result, our sample using prices from the EIU data may underrepresent alcohol prices in rural areas. In addition, we only have a limited number of price data points for each alcoholic beverage product in a country and exclude a few OECD countries due to the missing information on prices and taxes. Thus, our alcohol price data are not nationally representative, and our results

cannot be generalized to other countries. Second, we measure alcohol prices at the aggregate level at three different price levels: maximum, mean, and minimum. Thus, we cannot further examine differences in excise taxes across states or jurisdictions in a country. Future studies may employ other available sources to explore variations in excise taxes in countries over time and address the above limitations.

Despite these limitations, our study contributes to the literature by systematically examining the percentages of excise taxes in alcohol prices in OECD countries over time. Our study stimulates further research by providing a common metric for comparing and analyzing the effects of alcohol excise taxes as a percentage of retail prices in stores. Our measures of tax burden on alcohol prices inform researchers, policy makers, and public health professionals on the current situation and trends of alcohol excise taxes over time and across countries, and have policy implications related to identifying areas to improve, and reaching a target of the share of excise taxes in alcohol prices to achieve effective alcohol control.

5. Conclusion

Our study examines excise taxes as a percentage of final retail prices of products sold in stores (beer, wine, and liquor), and evaluates the trends of excise taxes as a percentage of final retail prices in 26 OECD countries during 2003–2018. Our results indicate that tax burden on alcoholic beverages is low in OECD countries. In OECD countries other than Scandinavian countries, the percentage of taxes to prices did not change much over time. Our findings suggest that there is ample room for increasing alcohol excise taxes, particularly for beer and wine.

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Contributors

AN wrote the first draft and revised the manuscript. CS led and conducted the analyses and revised the manuscript. All authors contributed to the study design, interpreted the results, and revised the manuscript.

Declaration of Competing Interest

The authors report no declarations of interest.

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