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CHAPTER FOR: Geography of Beer: Policies, Propaganda and Place

***Title:* What drives On- versus Off-Trade Beer Consumption? A Regional and Global Panel Analysis of 97 countries'**

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Abstract

This chapter examines the Elasticities of Demand of Beer (Price, Cross Price and Income). This shows how the drivers of demand for beer vary regionally. We break down this demand between on and off-trade consumption to show that these two markets have very distinct features, analysing data for 97 countries using Euromonitor data from 2006-2021, using a Panel Fixed Effects Model.

We find that off-trade beer is a complement for on-trade, the '*Prinks effect*' where beer is consumed at home before going to an on-trade venue, but on-trade beer is a substitute for off-trade beer. We identify region-specific differences such as: Western Europeans off-trade beer consumption falling as their incomes rise, and Eastern Europe being the only region where the '*Prinks effect*' doesn't hold.

We make recommendations around region specific similarities in on and off-trade which could be considered by businesses considering pricing and internationalisation policies.

Keywords: Beer consumption, on- versus off- trade, Location, Panel Analysis, Price Elasticity of Demand, Income Elasticity of Demand, Cross Price Elasticity of Demand

Introduction

Beer can be consumed either in places such as pubs, bars, restaurants (*on-trade*) or at home bought from a corner shop or a supermarket (*off-trade*). The importance of on-trade versus off-trade drinking has been discussed from a health perspective around the world, given the strong relationship between alcohol consumption and a range of alcohol-related harms (e.g. mortality, morbidity, wider social harms) are mostly associated with off-trade drinking as it is cheaper (Page et al., 2017; Robinson et al., 2015). Additionally, the comparison between off-trade drinking. On-trade offers ample opportunities to positively affect its local economy through providing employment, use of local products, supporting local services, encouraging social interactions which has shown to be good for people's mental health. The on-trade sector can also boost the local economy by attracting visitors to a place (Cabras et al., 2020; Mount & Cabras, 2016, Wells et al., 2019).

However, the global economic outlook has steadily worsened substantially over the last few years, especially considering lower growth expectations and higher uncertainty worldwide (Euromonitor, 2022a). This is a threat to the positive economic effects on-trade alcohol consumption has over off-trade alcohol consumption. The war in the Ukraine, the rise in energy prices, increasing in some places by 600% (Hampson, 2022), and the cost-of-living crisis have now hit an economy still recovering after to Covid (BBC, 2022). These uncertainties and shocks to supply chains have led to significant increases in energy and food prices especially for lower income households (BBC, 2022).

Recent studies have linked these macro-economic factors to a trend towards more off-trade alcohol consumption within the European context (Rabinovich et al., 2021; Tomlinson & Branston, 2014) and across the globe (Pomarici, Boccia & Catapano, 2012). Tomlinson & Branston (2014) specifically stated that the split between on- and off-trade sales is now almost 50:50, which they see as contributing to the ongoing demise of the traditional public house. This has been further sped up through an enforced, if temporary, behavioural change to off-trade drinking due to Covid lockdowns (Hardie et al., 2021).

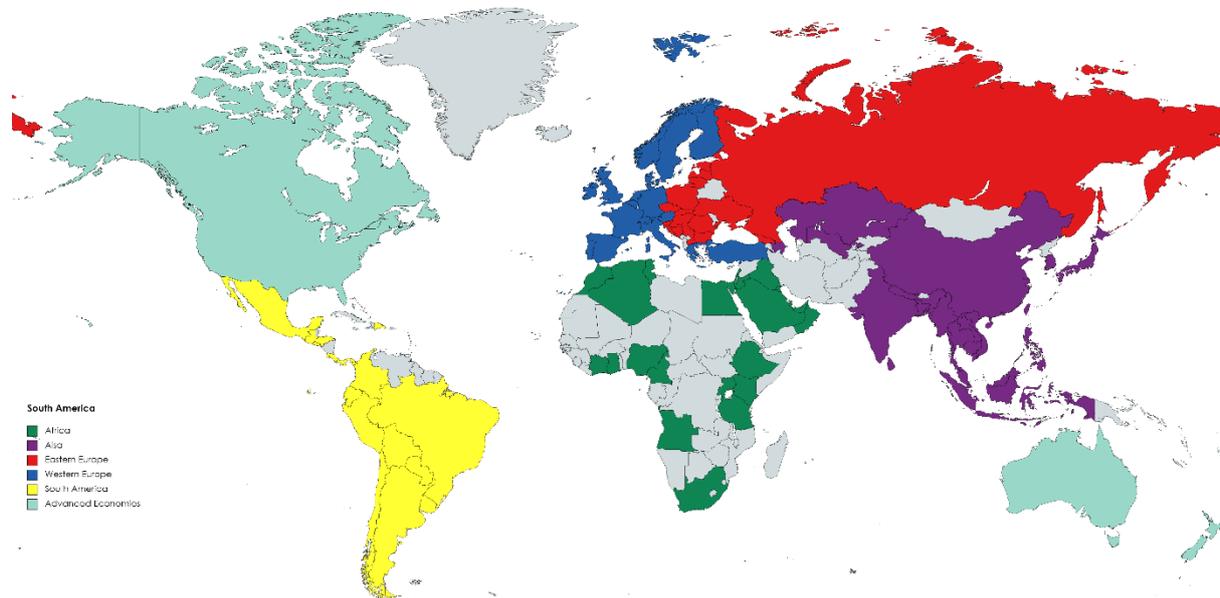
This outlook leads to the question of what key factors are driving alcohol consumption in on versus off-trade settings. Especially considering the importance of on-trade for the local economy and more responsible drinking behaviours. Various studies have investigated country specific factors (Sousa, 2014; Meng et al., 2014). However, there is a lack of research assessing the factors and mechanisms impacting on- versus off-trade drink sales - especially from a global or regional perspective which is particularly important to beer markets for business strategies during difficult economic times.

This chapter seeks to give answers to some of the questions around on and off-trade beer consumption for both business and policymakers. The global coverage of the data used will give an idea of how regions differ in terms of their sensitivity to changes in the price of their own product (Own Price Elasticity of Demand), changes in the price of another related good (Cross-Price Elasticity of Demand – here on and off trade beer are treated as related goods), and changes in income (Income Elasticity of Demand). This gap was not solely identified by the authors of the chapter but also by recent publications such as Nave et al. (2021) who conducted a systematic review and Shakina & Cabras (2021) who hoped that their research would stimulate investigations into beer pricing mechanisms in other countries outside the UK.

Annual global beer consumption data only goes back to 2006. Using a panel data approach will allow us to get more accurate answers, that can be drawn from the global dataset and allow for more conclusive answers to these questions. The data set covers 97 countries from 2016-2021 and will also

be analysed at a regional level to look for differences in consumption drivers, shown in map form in Fig. 1 below..

Fig 1. Countries Examined by Region



This chapter is split into the following sections. We first introduce literature around demand factors for on- vs off-trade, country specific demands and finally the impact of Covid as discussed in previous studies. We then introduce our empirical study to shed light on the posed questions. Starting with a brief introduction of the data followed by the discussion of key findings split into the world sample (full sample) and later on broken down into five key regions (Asia, Eastern Europe, Western Europe, Africa and South America) for each context we checked the income, own price and cross price elasticity.

On-trade versus off-trade demand factors

The demand for alcoholic beverages seems to have become more elastic with respect to changes in its own price since the mid-1950s and the income elasticity has been falling since the mid-1960s (Fogarty, 2010). Possible reasons for the trend might include an increase in the use and availability of alternative products to consume (soft drinks, wine and spirits) as substitutes. The author gives a wide range of estimates of the own price elasticity of beer (from +1.28 to -3) based on the country-level studies used in their meta-analysis. An issue with using the results from this and other studies like it is that many of these studies cover periods in the 1950s and 60s, and the majority come from the UK and other advanced economies. Eakins and Gallagher (2003) find that the Price Elasticity of demand for beer in Ireland lies in the region between -0.42 and -0.76.

Meng et al. (2014) estimated own-price elasticities for the UK from 2001-2009 using individual-level data and found that their own price elasticity of demand for beer was negative, with off-trade beer being more elastic. They estimate the relationship at -0.98, indicating that any increase in the real price of off-license beer would see a commensurate fall in sales volume. This would discourage businesses who wished to increase their revenue from increasing prices, while encouraging authorities who want to limit alcohol consumption to increase taxes on off-license beer. They also find a large negative price elasticity of demand for On-license beer at -0.78.

In terms of cross price elasticity in the UK Meng et al. (2014) find that an increase in on-trade prices in the UK results in a rise in off trade consumption, though the effect is small with a cross price elasticity of 0.14. However, increases in the price of off-license beer have a negative effect on on-trade sales, however the estimate is statistically insignificantly different from zero.

Robinson et al. (2014) investigated the impact of the alcohol act on off-trade alcohol sales in Scotland. A statistically significant reduction was observed in off-trade sales in Scotland, but this decline was driven by reduced off-trade sales of wine and pre-mixed rather than beer. Page et al. (2017) supported the above and demonstrated that a small increase in the price of alcohol, above inflation, in both markets, would substantially reduce the number of patients attending emergency departments for treatment of violence-related injuries in England and Wales. In the study by Ritchie et al.'s (2009a, 2009b) work they found. Ritchie et al.'s studies (2009a, 2009b) uncovered that much wine purchased by young adults is specifically for consumption at home, often pre-loading before a night out. From a behaviour angle, the argument could be made that the government should invest more support on-trade consumption. This would have a direct impact upon their subsequent behaviour in whichever pub or club they later frequent. However, it is often solely on-trade consumption which is held responsible for any resulting anti-social behaviour.

Sousa (2014) focused on the price elasticity of demand for alcohol. Spirits in the on-trade, and beer and cider in the off-trade, were found to be the most price elastic types of alcohol, while '*ready-to-drink*' in the on-trade and wine in both the on- and off-trade were found to be the least price sensitive. Grosova et al. (2017) conclude that income elasticity was insignificant, and rather the most important determinants of on-trade demand were the off-trade prices and substitute products. Finally, they concluded that Czech beer drinkers are less price sensitive in comparison to UK beer drinkers which was supported by a study by Tomlinson & Branston (2014). Rabinovich et al. (2012) identified an increase in income was associated with relatively higher levels of on-premises purchase of alcohol across four EU member states (Ireland, Finland, Latvia and Slovenia).

Gell & Meier (2011) found higher income households spent proportionately more on on-trade alcohol than lower-income households, however off-trade alcohol expenditure did not differ significantly according to household income.

Some studies have stated that off-trade could be seen as a substitute for on-trade drinking (Grosova et al., 2017) however when diving a bit deeper, others suggest there is a link between the off-trade versus on-trade in form of Prinks (pre-drinks: i.e. drinking before going out for the evening). Forsyth (2010) concluded that drinking before entering nightclubs was the norm, although the location and extent of this '*front-loading*' varied. This is further supported by Ritchie (2011) who discussed wine usage particularly by the younger female participants and beer or spirits as prinks by younger males; everyone buying a bottle, meeting up at someone's house, drinking before going out so that they needed to buy fewer drinks at the pub, or particularly night club, that they were going to end up in. Meng et al. (2014) indicate this relationship might exist, but as the results were insignificant, it could not be concluded from that study.

Regional and country specific demand

Most studies assessed price elasticity for consumer demand for alcohol consumption in specific countries (Sousa, 2014; Meng et al., 2014). Other studies like Fogarty (2010) conducted literature review and concluded only little support has been found for the idea that the demand for alcoholic

beverages varies fundamentally across most countries, with the exception of wine. Fogarty (2010) also argued that the demand for alcohol does not vary fundamentally across countries, a claim we will offer evidence against. This finding may be driven by the fact that most studies to date have focused on European, North American and Australasian markets. We will see below that other regions do not always follow the same pattern.

This idea is disputed by Pomarici, Boccia & Catapano (2012) and Robinovivh et al. (2012) who concluded that there are significant differences in the alcohol consumption in on-versus off-trade across the global and across four EU member states (Ireland, Finland, Latvia and Slovenia). Additionally, Posmarici, Boccia & Catapano, (2012) stated that patterns of consumption habits are driven by factors which are country/area specific. Wang et al. (1996) looked only at the US, but found that beer, wine and spirits are dominated by income effects over the substitution effect.

Covid impact

A recent study by Plata et al. (2022) pointed out a Covid paradox: health professionals were warning about a sharp rise in alcohol sales during lock down. However, Stevely et al. (2021) contradicted those worries in their study which found in Scotland there were no significant changes in alcohol consumption levels or the frequency of drinking overall. They suggested that increases in off-trade alcohol consumption offset any reductions in on-trade drinking. However, this drop or lack in increased sales of alcohol was not reflected in a reduction of alcohol-related harms (e.g., mortality, morbidity, wider social harms) instead alcohol-related harms increased during the Covid lockdowns. Therefore, more focused studies assessing consumer segments identified that certain consumer groups such as older individuals, essential workers, individuals with children and those suffering from high depression reported an increase in their consumption of alcohol (Plata et al., 2022). Excess purchases increased within the top one fifth of households that normally bought the most alcohol (Anderson et al. (2022). Their purchases increased by more than 17 times more than the bottom one fifth of households, that bought the least alcohol. Excess purchases were greater in the most deprived households, compared with the least deprived households. It was not just specific to the segmentation of increased alcohol consumption was identified, but also to the characteristics of drinking occasions (Hardie et al., 2021). The more focused study on consumer segments and occasions of drinking are pointing out the importance of changing consumer behaviour from at home drinking to a more social on-trade and more regulated consumption.

The last three years had a devastating impact on the beer industry worldwide, with on-trade dropping in some countries up to 100% due to strict lockdown rules. But that is not consistent across the world due to differences in Covid impact and restrictions. Additionally, anecdotal evidence highlights one key issue faced by breweries is access to markets and based on the size of the brewery the ability to adapt to different types of outlets.

Data

The data we use come from Euromonitor and covers 97 countries, all listed in the Appendix under Table A.1. Euromonitor groups these countries into regions¹ and the sample within each region is also shown in table A.1. The sample period covers 2006-2021 and only countries in Euromonitor that had all observations for all variables used over the full period were included.

¹ Asia, Eastern Europe, Western Europe, Africa, South America are used here.

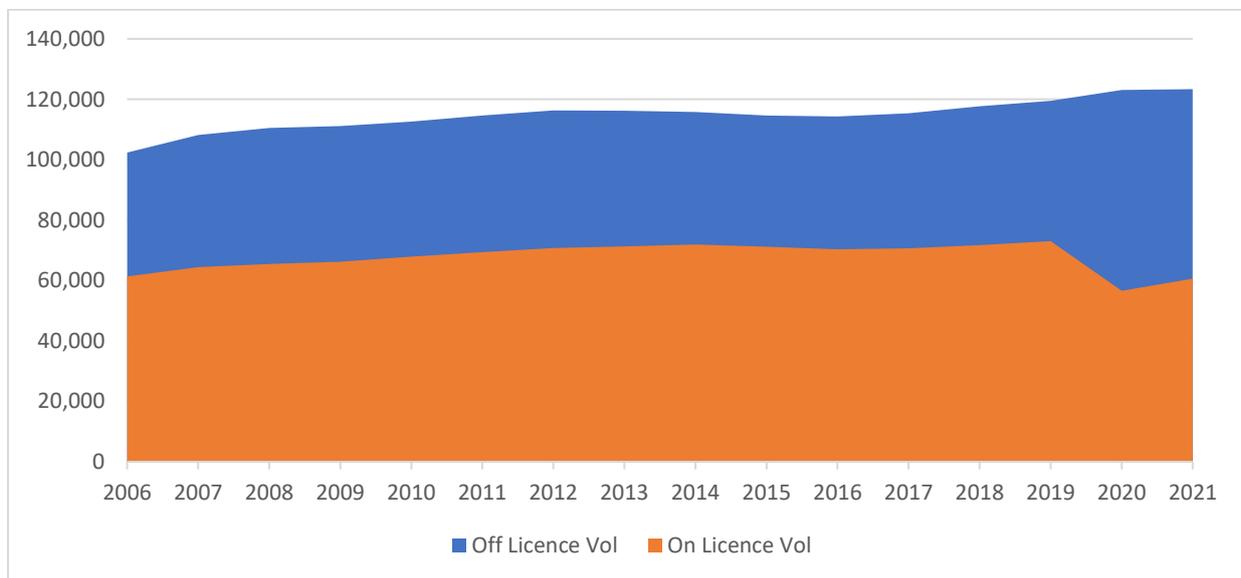
Table 1. Descriptive Statistics for 2021

	Units	Average	Standard Deviation
GDP Per Capita	Domestic Currency Units	2,427	7,724
On Trade Volume	million litres	689	2512
Off trade Volume	million litres	1163	3057
On Trade Retail Sales Price	Domestic Currency Units	541	1968
Off trade Retail Sales Price	Domestic Currency Units	378	1464
Population (15+)	Thousands	24,491	96,744
Inflation Index	Base year 2006	242	252

Source: Euromonitor

Fig. 2 shows a growth of over 20% in the volume of beer sold globally, between the start of our sample in 2006 and its end in 2021. The 2020 Covid Pandemic is clearly visible with a significant fall in On-trade sales in 2020 that had not recovered by 2021. However, Off-Trade sales more than made up for that, with total beer volume increasing by over 3 billion litres in 2020, but only 234 million in 2021 despite the recovery in On-trade volumes.

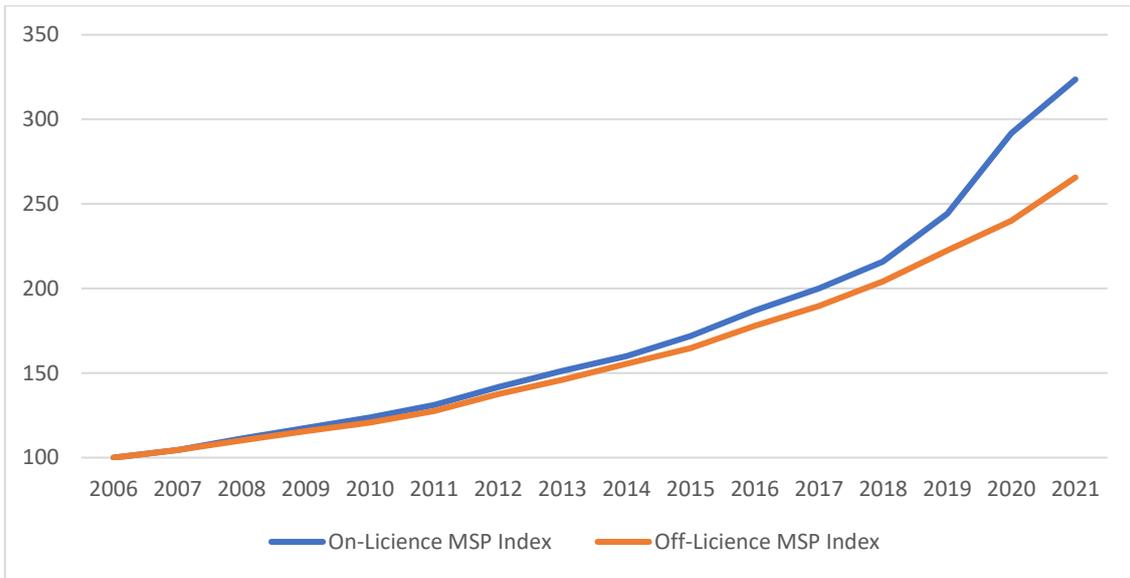
Fig. 2: World On and Off-Trade Beer Consumption, Litres Millions



Source: Euromonitor

An unweighted price index for the average price of beer across the full sample of countries is shown in Fig. 3 below. With prices rising in both categories across the full sample we can see that the average on-trade price outpaced increases in off-trade prices by 20% over the full sample period.

Fig 3: World On and Off-Trade Market Sales Beer Price Index², 2006=100



Source: Euromonitor, Authors Calculation

Methodology

We assess three types of econometric specifications. These are Pooled OLS, and panel models with Random Effects or Fixed Effects. We begin by assessing the simplest econometric specification, Pooled OLS, by using Whites and the Breusch Pagan tests for heteroscedasticity and Durbin-Watson tests for autocorrelation. If these issues are not present when the Pooled OLS method would be used. In practice this is unlikely as Pooled OLS would treat all countries as homogenous, which is rarely the case in international samples - making Fixed or Random effects model more likely to be appropriate. A Hausman Test of Fixed versus Random effects is used following the estimation of the same model specifications using Fixed and Random effect as below.

$$\chi^2(k) = (b - B)'[Var(b) - Var(B)]^{-1}(b - B), \quad (1)$$

where b are the coefficients the Fixed effects model and B are the coefficients from the Random effects model, $Var()$ represents the Variance-Covariance Matrix a model.

In this study Fixed effects is found to be more applicable, as has been the case in most past cross-country studies of price elasticity. Our model takes the following form:

$$Vol_{i,t} = \alpha + \beta_1 P_{it} + \beta_2 CP_{it} + \beta_3 Y_{it} + \mu_i + v_{it} \quad (2)$$

Where $Vol_{i,t}$ are country j 's volume of sales per capita in year t , P is the real price of the good itself, CP is the alternative goods real price, Y is real income. μ_i represents the fixed effect of country i , and v_{it} is the disturbance term.

As in Lee et al. (2015) we will assess the impact of Covid on model specification through a likelihood ratio test. This takes the form:

² An index is used as the prices used here are all in local currency terms.

$$LRT = -2 (L_r - L_{ur}) \quad (3)$$

where L_r is log-likelihood of the restricted (simpler) model and L_{ur} is log-likelihood the unrestricted model (more complex). The effect of Covid will be included as a simple level dummy variable in one specification and as slope dummies on each of the independent variables in the final specification.

Results: Pre-Test

For the full sample and all subsamples analysed below, Whites and the Breusch Pagan tests for heteroscedasticity indicated that there is heteroscedasticity in all Pooled OLS regression results. Durbin-Watson tests all indicate that there is also strong positive autocorrelation in the Pooled OLS. These results indicates that Polled OLS is inappropriate for this data. The results for the full sample are available in the appendix Table A.2. Results for each region are available on request.

A Hausman Test of Fixed versus Random Effects was then run for all sub samples which indicated that we should chose Fixed Effects in almost all cases. Accordingly, the FE-model seems to be the most suitable because we have endogeneity. For simplicity all the results below are for Fixed effects regressions. The results for the Fixed and Random effects for each equation were extremely similar in size and sign.³

Results: Full sample

We will first look at results for elasticities relative to the Volume of beer sold per capita for the world. We use per capita measures to remove effect of rising populations on calculated elasticities. As this is a real variable (unaffected by monetary inflation), we also use real (inflation adjusted) measures of GDP per capita and prices for on- and off-trade beer. All variables are expressed as natural logs to allow for easier interpretation.

Table 2: On-trade Sales Volume per Capita – Full Sample

	(1)	(2)	(3)	(4)	(5)
Constant	-4.088 <i>0.000</i>	-4.156 <i>0.000</i>	-5.450 <i>0.000</i>	-6.159 <i>0.000</i>	-5.999 <i>0.000</i>
Ln Real On-trade Price	-0.162 <i>0.000</i>	-0.054 <i>0.174</i>	-0.235 <i>0.000</i>	-0.140 <i>0.000</i>	-0.148 <i>0.0003</i>
Ln Real Off-Trade Price	-0.223 <i>0.000</i>	-0.289 <i>0.000</i>	-0.232 <i>0.000</i>	-0.315 <i>0.000</i>	-0.332 <i>0.000</i>
Ln Real per Capita	-	-	0.341 <i>0.000</i>	0.499 <i>0.000</i>	0.472 <i>0.000</i>
Covid Dummy (2020-1)	-	-0.287 <i>0.000</i>	-	-0.337 <i>0.000</i>	-
Ln Real On-trade Price, Covid Dummy	-	-	-	-	-0.113 <i>0.000</i>
Ln Real Off-Trade Price, Covid Dummy	-	-	-	-	0.144 <i>0.000</i>
	-	-	-	-	-0.067

³ Results for the full sample are available in appendix A and for all subsamples are available on request.

Ln Real GDP per Capita, Covid Dummy					<i>0.000</i>
Log-Likelihood	<i>171.190</i>	<i>334.450</i>	<i>217.830</i>	<i>456.650</i>	<i>423.920</i>
Likelihood Ratio Test	-	(1) vs (2) 0.000	(1) vs (3) 0.000	(3) vs (4) 0.000	(3) vs (2) 0.000

Note: Coefficients with P-Values below in Italics, Fixed Effects Panel regression

Table 2 above shows the results of the Fixed Effects panel regressions using the full sample of countries where on-trade sales volume per capita is the independent variable. Table 3 below carries out the same analysis but for off-trade sales per capita.

Across all specifications, for both on- and off-trade sales, we can see that the constant term is negative and significant. As these regressions are in log-log, this is a log variable and when converted back these are positive numbers, indicating a base level of demand for beer. For example, for specification (5) above a constant of -5.999 translates to 0.002 litres of consumption per capita, when all other variables are equal to zero. So, while the constant terms in all the regressions are statistically significantly different from zero, they are economically insignificant in determining the level of consumption.

The Own Price Elasticity of Demand for on-trade beer per capita is given in the 2nd row (Ln on-trade Price). Regardless of specification the answer is the same - a rise in the price of on-trade Beer results in a fall in sales volume, but the fall in sales volumes is much smaller than the rise in price meaning that a profit maximising On-trade business should increase beer prices. A 1% increase in price lead to between a 0.16% and 0.148% fall in sales volume, per specification (1) and (5) respectively.

For consumers beer in an on-trade setting seems to be the natural *substitute* for beer in an off-trade setting, and vice versa. Here we look at the Cross-Price Elasticity of Demand for on- and off-trade beer sales. In Table 2 a 1% price *rise* in off-trade prices results in a *fall* in on-trade sales of between 0.23-0.33% across the various equation specifications. This means that off-trade beer is a *complement* for on-trade beer, and not a *substitute* as might be expected, with their consumption rising together. This seems to relate to the fact that on-trade beer consumers are likely to also consume off-trade beer, possibly before going to a licenced premise, a practice sometimes referred to as “*Prinks*”.

Models (1) and (2) are Hicksian, or compensated, elasticities - where no Income Elasticity is included. Models (3)-(5) are Marshallian, or uncompensated, Elasticities where income is controlled for. As the signs on the Cross-price elasticities for both tables 2 and 3 remain the same, whether we use Hicksian or Marshallian elasticities, we can say that income effects do not dominate substitution effect. This is in contrast to Wang et al. (1996) who look only at the US but find that Beer, Wine and Spirits are dominated by Income Effects over the substitution effect.

The Income Elasticity of demand for beer is similar regardless of how we choose to specify our equations. For on-trade Sales a 1% increase in GDP per Capita results in between a 0.34% increase in the volume of beer sold per specification (3) and 0.47% increase per (5). This makes beer a *normal good* as would be expected, with consumption increasing as income increases across the world. As the results are significant, they also contradict Grosova et al. (2017) who find income to be insignificant.

As it is untested whether the pandemic would change the level of demand or effect slope of the independent variables we go through several specifications. In Models (2) and (4) we include a level

dummy for the two years effected by the Covid pandemic, 2021-22⁴. We see a consistent reduction in the level of on-trade sales per capital and as the likihood-ratio test is significant in both cases we would conclude that including these dummy variables improves the explanatory power of the models.

Once slope dummies are included the Covid constant becomes insignificant, so we only include slope dummies in model (5). The Income Elasticity of Demand for on-trades sales falls from 0.472 pre-pandemic by 0.067 to 0.405 during Covid effected periods, making on-trade consumers consumptions levels less sensitive to changes income. This can be explained as increases income for many consumers in many countries at various times could not be spent on trade as these premises were shut.

The effect of the pandemic on Own Price Elasticity of Demand for on-trade sales is dramatic. Including this slope dummy doubles consumers' price sensitivity, from -0.148 pre pandemic to -0.261 during Covid effected periods making them much more price sensitive. Finally, we see a large reduction in the sensitivity of On-trade sales to Off-Trade real prices, falling from -0.33 to -0.188 post pandemic.

Table 3: Off-Trade Sales Volume per Capita – Full Sample

	(1)	(2)	(3)	(4)	(5)
Constant	-3.364 <i>0.000</i>	-3.342 <i>0.000</i>	-5.401 <i>0.000</i>	-5.318 <i>0.000</i>	-5.280 <i>0.000</i>
Ln Real On-trade Price	0.196 <i>0.000</i>	0.162 <i>0.000</i>	0.087 <i>0.008</i>	0.076 <i>0.022</i>	0.103 <i>0.004</i>
Ln Real Off-Trade Price	-0.570 <i>0.000</i>	-0.549 <i>0.000</i>	-0.584 <i>0.000</i>	-0.575 <i>0.000</i>	-0.589 <i>0.000</i>
Ln Real per Capita	-		0.510 <i>0.000</i>	0.492 <i>0.000</i>	0.477 <i>0.000</i>
Covid Dummy (2020-1)	-	0.089 <i>0.000</i>	-	0.040 <i>0.003</i>	-
Ln Real On-trade Price, Covid Dummy	-	-	-	-	-0.043 <i>0.097</i>
Ln Real Off-Trade Price, Covid Dummy	-	-	-	-	0.047 <i>0.082</i>
Ln Real GDP per Capita, Covid Dummy	-	-	-	-	0.011 <i>0.004</i>
Log-Likelihood	459.010	479.860	620.140	624.850	631.270
Likelihood Ratio Test	-	(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.001</i>	(3) vs (5) <i>0.000</i>

Note: Coefficients with P-Values below in Italics, Fixed Effects Panel regression

Table 3 shows the Own price Elasticity of Demand for off-Trade beer in the 3rd row (Ln Off-Trade Price). Regardless of specification off-Trade sales follow the law of demand - a rise in price causes a fall in the volume of demand. Off-trade consumers are more price sensitive than on- trade customers with a 1% price rise resulting in between a 0.5% and 0.59% decrease in demand. While these consumers are more price sensitive it would still be sensible for an off-Trade to rise prices under this analysis as the percentage rise in price will be larger than the fall in sales.

⁴ Using only 2021 as a dummy was also tested but only has a marginal effect on the results.

The Cross-Price Elasticity of Demand for off-Trade sales are as expected. A 1% rise in on-trade Prices (showing in row 2 of Table 3) are all positive and statistically insignificant – indicating a weak substitution effect with a 1% rise in real On-trades prices resulting in between a 0.09-0.2% increase in Off-Trade Consumption. The difference shown here indicates that consumers of Off-Trade beer act differently to those consuming On-trade beer⁵.

The Income Elasticity of demand for beer for off-Trade sales are similar but are generally slightly more elastic with a larger response from a change in income. A 1% increase in GDP per Capita will on average across the world lead to a 0.477% increase in the volume of beer sold off trades per model (5) in Table 3.

Similar to the estimations for on-trade beer, adding in dummies to account for Covid effected periods improves the model as we move from specification (1) to (5) as shown by the significances of the likelihood-ratio tests. Here the constant dummy in (2) and (4) show that the average consumption of beer per capita rose by between 1 and 2 litres across the world during Covid. If we look at the slope dummies, we can see that the size of the coefficients is much smaller for own and cross price elasticities, and they are statistically insignificant. However, the effect of Covid on spending from increases income is the opposite of that seen on the on-trade estimations. Off-Trade consumers spend more of any increase in income during Covid.

Results: Regional analysis - Income Elasticities

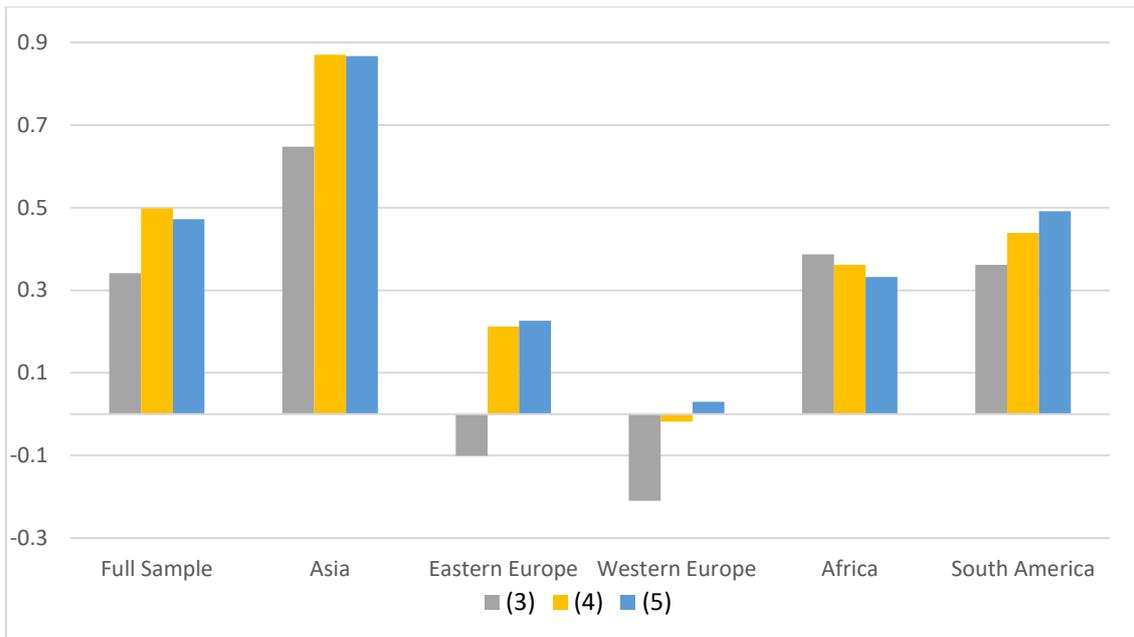
Next, we now turn our attention to geographic differences we find in these relationships depending on what region we are looking at. Detailed results for each region following the same pattern as the tables above for the whole sample are given in the Appendix. We visualise the results in this section here for easier comparison.

The sensitivity of on-trade beer consumption per capita across the regions with respect to a change in income is wide, as are shown in Figure 3. For Asia we see almost a unit elasticity, where a 1% rise in income sees an almost 0.9% increase in the volume of beer consumed on-trade. African and South American countries show a similar income elasticity of demand to the world average, while eastern European countries are lower. Western Europe shows no significant income elasticity with increases or decreases in come having no real effect on the volume of on-trade beer consumed per capita. Specification (3) does not account for Covid years and shows a negative relationship which we believe can be discounted as model (4) is shown to be a superior model through the Likelihood-ratio test.

Covid did reduce the Income Elasticity of Demand for on-trade beer across all regions by 0.1 on average. The Outlier is Africa, where the relations stayed the same as pre-Covid, this can be explained by the different durations of the “stay-at-home” lock down requirements between all regions in comparison to Africa (Hale, et al., 2021).

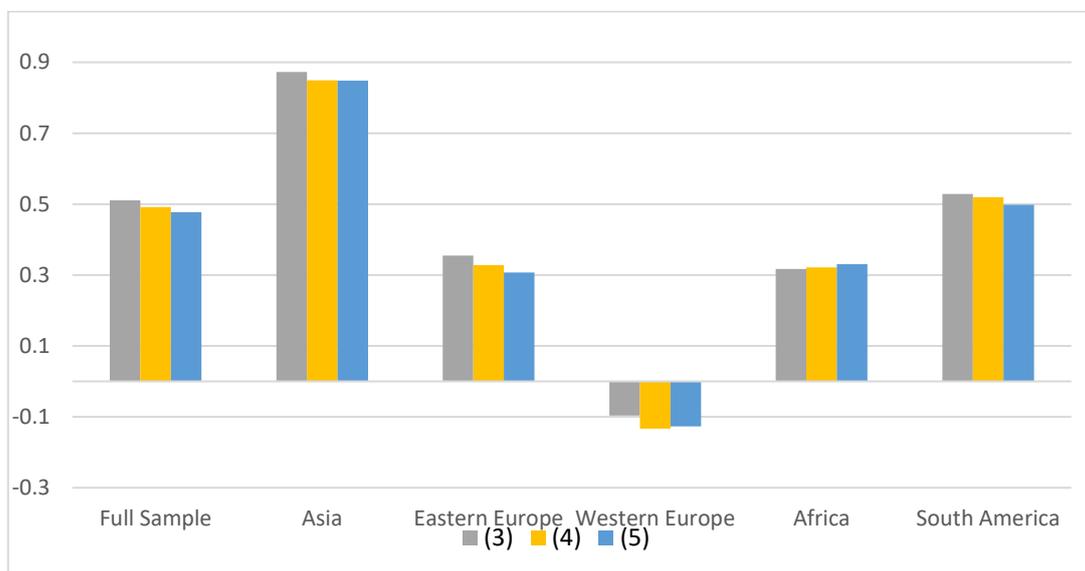
Figure 3: On-trade Income Elasticities of Demand

⁵ See “Prinks” above.



The relationship between income and off-trade consumption follows a similar pattern with consumption rising with income in all regions bar Western Europe. Here the relationship is negative and significant, if small economically. A 1% rise in GDP per capita in Western Europe see off-trade beer consumption fall by .1% approximately. This implies that off-trade beer is an *inferior good* in Western Europe – with either reductions in alcohol consumption in general as income rises or switching into other forms of alcohol.

Figure 4: Off-Trade Income Elasticities of Demand



Across all the regions the effect of Covid on the Income Elasticity of Demand for off-trade Beer was insignificant statistically and economically. No significant differences here can be justified due to the nature of continued availability of the off-trade market in comparison to on-trade.

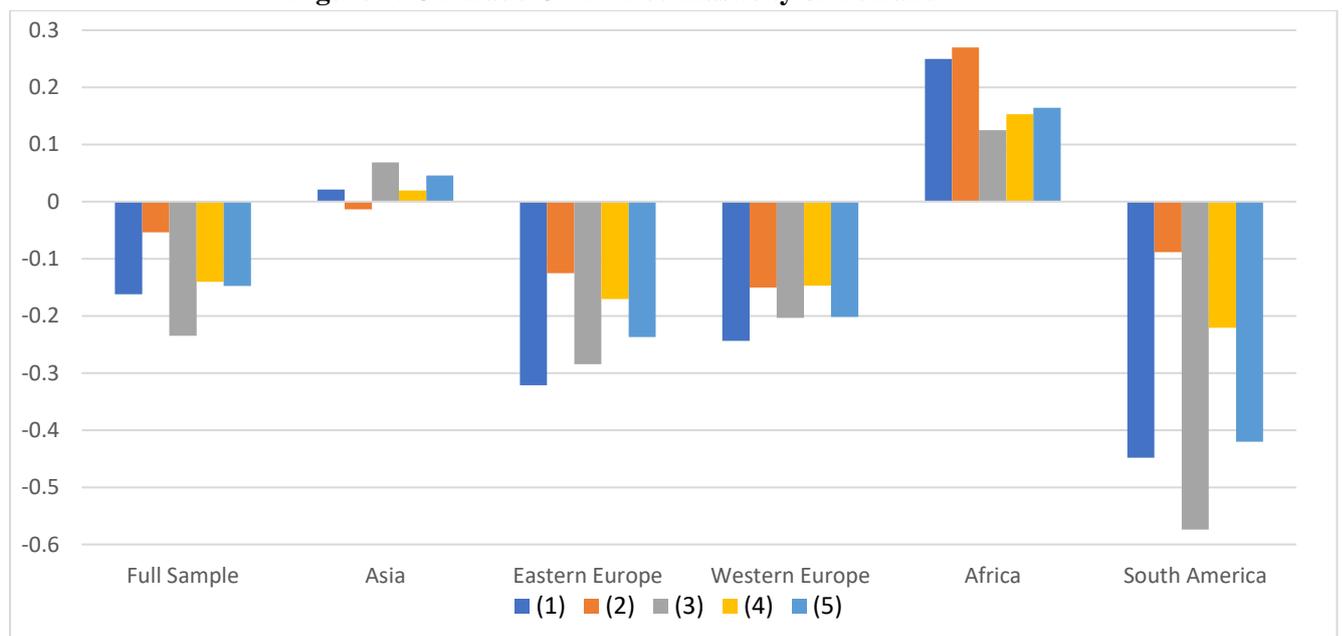
Results: Regional analysis - Own Price Elasticities

Consumers price sensitivities for on-trade beer were found to be very low in the full sample – coming in at a 0.1% fall in consumption for a 1% increase in price, however the picture is very variable across regions with only Europe following that number closely. In South America the number varies quite a lot depending on the model specification but as (4) has the highest explanatory power the true Own Price Elasticity seems to be about -0.22 – larger but not too different to Europe.

Asia offers a different answer where consumers are found to be price insensitive. The measure of the Own Price elasticity is small and statistically insignificant – indicating significant room for on-trade sellers to increase prices while also increasing their revenue. Africa is very unusual with a positive and statistically significant Own Price Elasticity of over 0.1. This means that consuming beer on-trade is seen in Africa as a form of conspicuous consumption – a way of showing your prosperity and consuming more as prices increase.

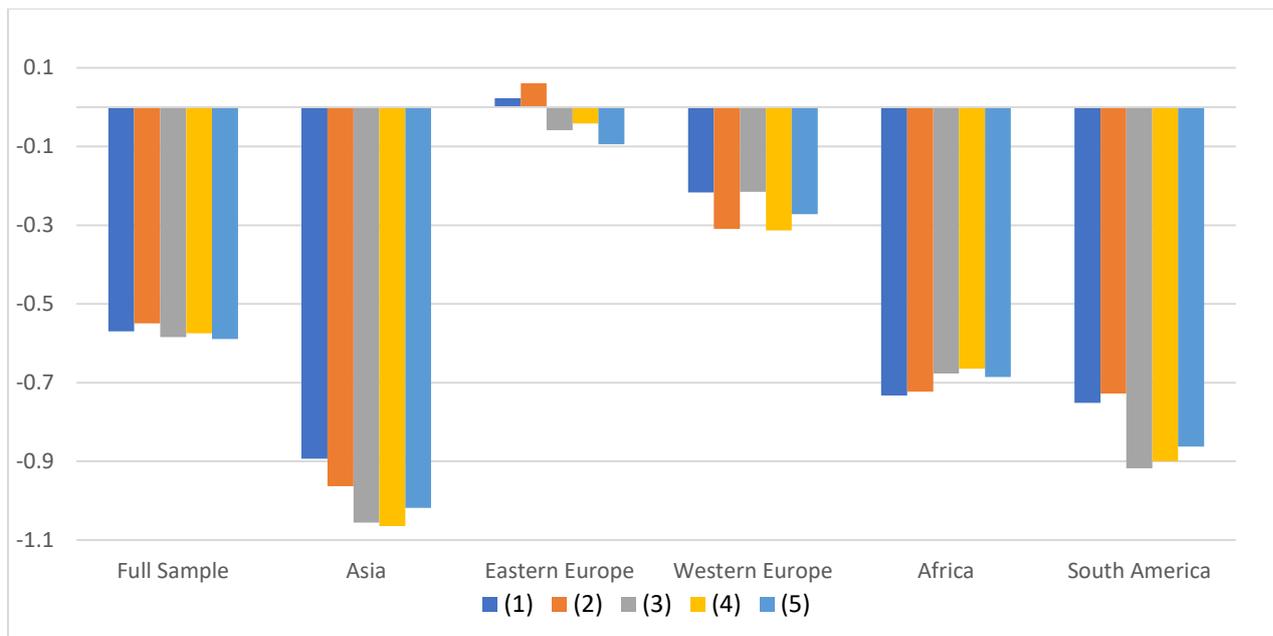
During Covid these numbers change for Africa and move to a small negative Own Price Elasticity of on-trade consumption. In Asia there is a large increase of 0.5 so that they consume more even as prices rise, or less even with price falls.

Figure 5: On-trade Own Price Elasticity of Demand



Consumers of off-trade beer are more homogenous across regions, as can be seen in Figure 6 bar Eastern Europe. They are insensitive to price changes in Off-Trade beer, as the estimates are small and statistically insignificant regardless of the model specification. Western Europe are less price sensitive than the average while Asia is the most price sensitive – with an almost unit elasticity. This implies that off-trade price increases in Asia would not increase revenue, as the decrease in the volume of their sales would be of a similar magnitude.

Figure 6: Off-Trade Own Price Elasticity of Demand

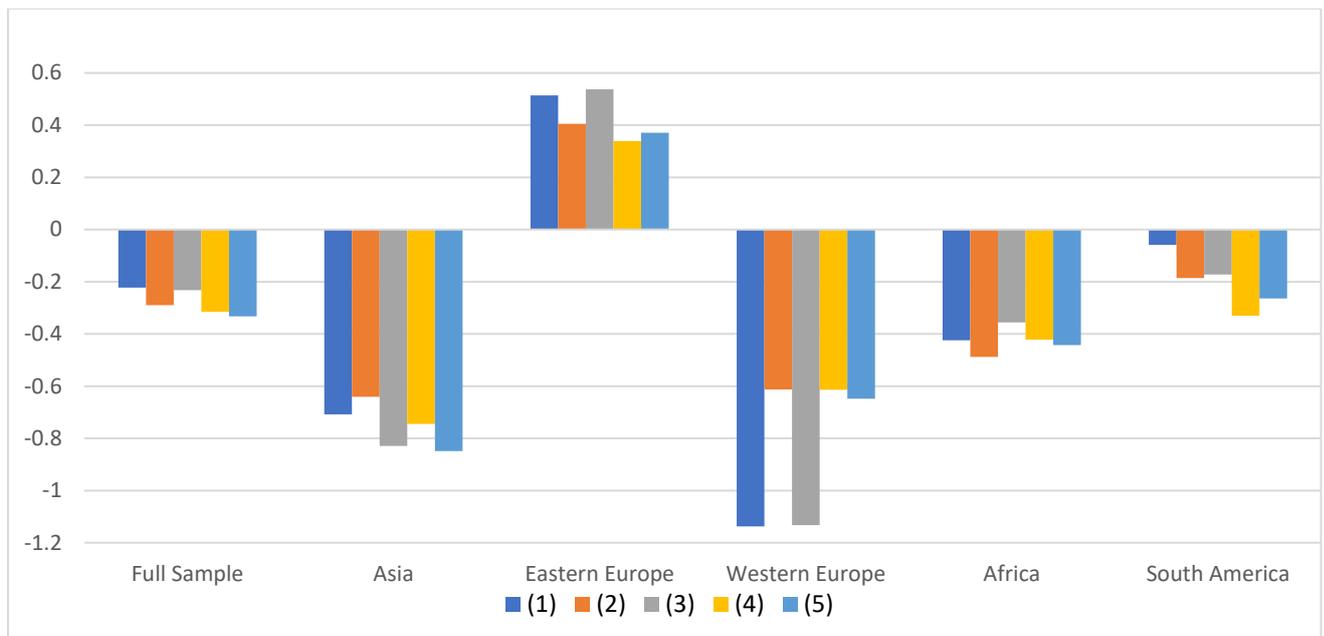


During Covid Eastern European consumers of off-trade beer saw a significant increase in their price elasticity to +0.15, meaning that they consumed more beer even as prices rose. In contrast Asian consumers became even more price sensitive increasing to over -1.1. This can be explained by combining the lock down policies and checking for the income support during COVID. Meaning that especially in Europe in comparison to the Asian region, there we more income support during the Covid pandemic (Hale, et. al., 2021)

Results: Regional analysis – Cross Price Elasticities

For the full sample results above, we saw a ‘*prinks effect*’ where increases in the price of off-trade beer had a negative impact unlicensed consumption. Breaking this down by region this effect holds true everywhere except Eastern Europe, where off-trade beer is a substitute for on-trade beer consumption. A 1% increase in the cost of off-trade beer causes on-trade beer sales volumes to fall by about 0.4%. Asia and Western Europe see a much larger Prinks effect, between -0.6 and -0.8, South American cross price elasticities of demand are similar to the full sample. This again points to Eastern Europe as being a very different market for beer sales compared to the others.

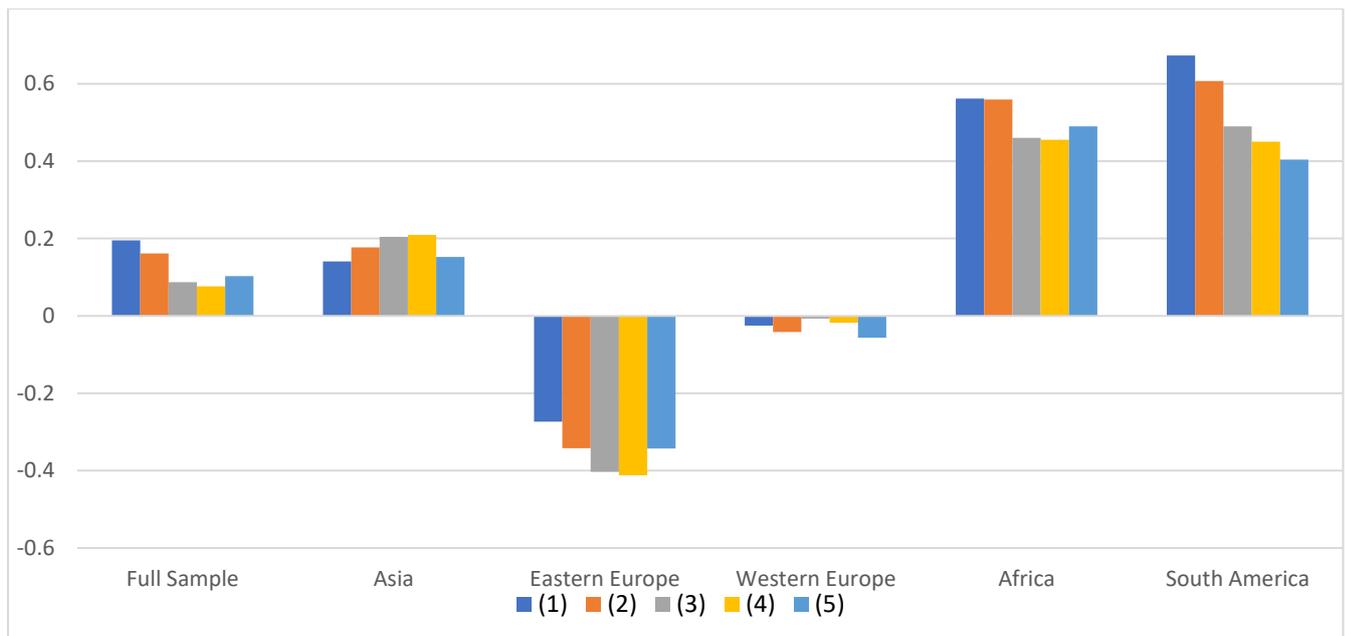
Figure 7: Cross Price Elasticities of Demand – On-trade



While for the full sample Covid reduced cross price plasticity demand to near zero for on- trade consumption, some regions did see some significant changes. Asia saw a significant increase to approximately -1.3. Western Europe saw small reduction in sensitivity to -0.5 and African cost prices elasticities halved to -0.2. These numbers are somewhat difficult to interpret as in many cases consumers were barred from on-trade consumption. This difference might be explained by the level of re-enforcement of local policies, the duration of COVID lock down restrictions but also the longer effect on people converting to working from home (Hale et. al., 2021), but is beyond the scope of this chapter.

Cross price electricity demand for off-trade beer again sees Eastern Europe as an outlier. Increases in on-trade prices in Eastern Europe cause a fall in off-trade demand. In Western Europe we see an insignificant relationship between the two, so the off-trade consumption is unaffected by on-trade prices. For Africa and South America there is a much larger substitution effect. An increase in on-trade prices of 1% results in an increase in Off-trade demand of approximately 0.4% in both cases.

Figure 8: Cross Price Elasticities of Demand – Off-Trade



The cross-price elasticity of demand for off-trade beer in Eastern Europe almost doubled to -0.6 during Covid effected periods. Asia sees an increase to approximately 0.5, a similar level to South America, heightening the substitution from On to Off-trade beer in those two markets.

Conclusion

The above findings show that calculating any of the three types of elasticities here for beer requires the on- and off-trade markets to be separated and one regions result's are not necessarily generalisable to another, as we see a differences in sensitivities where the sign is different from one region to the next. The Own Price Elasticity for off-trade beer is about 4 times greater than for on-trade beer.

For businesses, this implies that on-trade premises have much more room to increase prices than their Off-trade competitors. The reasons for this are not investigated here but may relate to the ability of on-trades businesses being able to differentiate themselves more and attract customers for reasons beyond simple consumption of beer. On-trade premises are a hub for socialising, consumers receive more than just a drink, they are a space to meet friends, go with their partner or meet work colleagues outside the office. In On-trade premises customers have the chance to enjoy a conversation, maybe over a meal and a drink, play some games or even find a group of people to open up about personal problems (Mount and Cabras, 2016; Wells and Waehning, 2022).

For policymakers, the own-price elasticities of beer above indicate that for these beverage types introducing minimum unit pricing will have a larger effect on total off-trade consumption. However, studies such as Meng, et al. (2014) who use individual level data rather than the macro level data used here give more useful conclusions if the policy is about targeting particular types of drinkers rather than the national level of consumption. Hence the importance of adopting a stricter approach for off-trade alcohol sales to not only kick start a behaviour change away from drinking alone at home but also towards a more sensible behaviour and lifestyle of drinking on-trade.

Post 2022 it will be interesting to see whether the old estimates of the three elasticities measure here reassert themselves. Will on-trade consumers remain more sensitive to increases in price than off-trade consumers, less willing to spend income increases on-trade, and more affected by changes in off trades prices.

The insignificance of Income as an explanatory variable for beer consumption in Western Europe and lower significance in Eastern Europe relative to the other regions highlights the importance not assuming that these patterns will hold in all regions. Income elasticity is much higher outside of Europe and always significant. This shows that while Grosova et al 2014 are correct, their results are not generalisable across the world.

Future studies should look to assess other factors impacting the hospitality industry, such as the intersection of non and low-alcoholic products and cannabis legalisation which according to Euromonitor (2022b) is holding great potential for the industry relevance and direction, especially considering more countries are considering the legalisation of cannabis. A similar examination of regional patterns of elasticities for other forms of alcoholic and non-alcoholic drinks would allow business and policy makers where the patterns identified here also exist for other beverages.

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Appendix

Table A.1 All Countries and Sub-Group

Africa	Asia	Eastern Europe	Western Europe	South America	Advanced Economies
Algeria	Azerbaijan	Belarus	Austria	Argentina	Australia
Angola	Bangladesh	Bosnia	Belgium	Bolivia	New Zealand
Cameroon	Cambodia	Bulgaria	Denmark	Brazil	Canada
Côte d'Ivoire	China	Croatia	Finland	Chile	USA
Egypt	Hong Kong China	Czech Republic	France	Colombia	
Ethiopia	India	Estonia	Germany	Costa Rica	
Ghana	Indonesia	Georgia	Greece	Dominican Republic	
Iraq	Japan	Hungary	Ireland	Ecuador	
Israel	Kazakhstan	Latvia	Italy	El Salvador	
Jordan	Laos	Lithuania	Netherlands	Guatemala	
Kenya	Malaysia	North Macedonia	Norway	Honduras	
Kuwait	Myanmar	Poland	Portugal	Mexico	
Lebanon	Pakistan	Romania	Spain	Panama	
Morocco	Philippines	Russia	Sweden	Paraguay	
Nigeria	Singapore	Serbia	Switzerland	Peru	
Oman	South Korea	Slovakia	Turkey	Uruguay	
Qatar	Sri Lanka	Slovenia	United Kingdom		
Saudi	Taiwan	Ukraine			
South	Thailand				
Tanzania	Uzbekistan				
Tunisia	Vietnam				
Uganda					
United Arab Emirates					

Table A.2: Test of for model specification - Full Sample

	On Trade Volume per Capita			Off trade Volume per Capita		
	Pooled	Fixed Effects	Random Effects	Pooled	Fixed Effects	Random Effects
Constant	4.683 <i>0.000</i>	3.310 <i>0.000</i>	3.423 <i>0.000</i>	5.594 <i>0.000</i>	3.559 <i>0.000</i>	3.685 <i>0.000</i>
Ln Real On-trade Price	-1.335 <i>0.000</i>	-0.235 <i>0.000</i>	-0.236 <i>0.000</i>	-1.145 <i>0.001</i>	0.067 <i>0.085</i>	0.067 <i>0.087</i>
Ln Real Off-Trade Price	1.226 <i>0.001</i>	-0.245 <i>0.000</i>	-0.174 <i>0.002</i>	1.047 <i>0.003</i>	-0.496 <i>0.000</i>	-0.434 <i>0.000</i>
Ln Real per Capita	0.138 <i>0.074</i>	0.530 <i>0.000</i>	0.475 <i>0.000</i>	0.107 <i>0.126</i>	0.612 <i>0.000</i>	0.558 <i>0.000</i>
White Test LM Stat	<i>113.129</i> <i>0.000</i>			<i>95.585</i> <i>0.000</i>		
Breusch Pagan LM Stat	<i>55.341</i> <i>0.000</i>			<i>30.068</i> <i>0.000</i>		
DW - Stat	0.133			0.135		
Hausman Test		11.169 <i>0.024</i>			43.455 <i>0.000</i>	

Note: Coefficients with P-Values below in Italics.

Table A.3: On and Off-Trade Sales Volume per Capita – Asia

	On Trade Vol per Capita					Off trade Vol per Capita				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	-3.997 <i>0.000</i>	-4.052 <i>0.000</i>	-7.723 <i>0.000</i>	-9.109 <i>0.000</i>	-8.888 <i>0.000</i>	-3.014 <i>0.000</i>	-2.956 <i>0.000</i>	-8.038 <i>0.000</i>	-7.890 <i>0.000</i>	-7.846 <i>0.000</i>
Ln Real On-trade Price	0.021 <i>0.887</i>	-0.014 <i>0.926</i>	0.069 <i>0.616</i>	0.020 <i>0.876</i>	0.046 <i>0.711</i>	0.141 <i>0.316</i>	0.177 <i>0.194</i>	0.205 <i>0.072</i>	0.210 <i>0.065</i>	0.152 <i>0.177</i>
Ln Real Off-Trade Price	-0.708 <i>0.001</i>	-0.641 <i>0.003</i>	-0.829 <i>0.000</i>	-0.745 <i>0.000</i>	-0.849 <i>0.000</i>	-0.893 <i>0.000</i>	-0.963 <i>0.000</i>	-1.056 <i>0.000</i>	-1.065 <i>0.000</i>	-1.018 <i>0.000</i>
Ln Real per Capita			0.647 <i>0.000</i>	0.870 <i>0.000</i>	0.867 <i>0.000</i>			0.873 <i>0.000</i>	0.849 <i>0.000</i>	0.849 <i>0.000</i>
Covid Dummy (2020-1)		-0.205 <i>0.000</i>		-0.382 <i>0.000</i>			0.214 <i>0.000</i>		0.041 <i>0.338</i>	
Ln Real On-trade Price, Covid Dummy					0.507 <i>0.006</i>					0.313 <i>0.059</i>
Ln Real Off-Trade Price, Covid Dummy					-0.459 <i>0.012</i>					-0.271 <i>0.102</i>
Ln Real GDP per Capita, Covid Dummy					-0.089 <i>0.000</i>					-0.020 <i>0.036</i>
Log-Likelihood	- <i>78.925</i>	- <i>70.751</i>	- <i>48.366</i>	- <i>16.013</i>	- <i>8.663</i>	- <i>55.789</i>	- <i>45.445</i>	- <i>15.875</i>	- <i>16.371</i>	- <i>22.833</i>
Likelihood Ratio Test		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.000</i>	(3) vs (5) <i>0.000</i>		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.244</i>	(3) vs (5) <i>0.001</i>

Note: Coefficients with P-Values below in Italics, Fixed Effects Panel regression

Table A.4: On and Off-Trade Sales Volume per Capita – Eastern Europe

	On Trade Vol per Capita					Off trade Vol per Capita				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	-4.451 <i>0.000</i>	-4.540 <i>0.000</i>	-4.172 <i>0.000</i>	-5.139 <i>0.000</i>	-5.142 <i>0.000</i>	-2.447 <i>0.000</i>	-2.416 <i>0.000</i>	-3.424 <i>0.000</i>	-3.342 <i>0.000</i>	-3.2952 <i>0.000</i>
Ln Real On-trade Price	-0.321 <i>0.001</i>	-0.125 <i>0.116</i>	-0.285 <i>0.003</i>	-0.171 <i>0.031</i>	-0.237 <i>0.005</i>	-0.273 <i>0.000</i>	-0.342 <i>0.000</i>	-0.403 <i>0.000</i>	-0.412 <i>0.000</i>	-0.3428 <i>0.000</i>
Ln Real Off-Trade Price	0.514 <i>0.001</i>	0.405 <i>0.002</i>	0.537 <i>0.001</i>	0.339 <i>0.009</i>	0.371 <i>0.004</i>	0.023 <i>0.828</i>	0.061 <i>0.543</i>	-0.058 <i>0.519</i>	-0.042 <i>0.648</i>	-0.0939 <i>0.311</i>
Ln Real per Capita			-0.101 <i>0.123</i>	0.212 <i>0.001</i>	0.227 <i>0.000</i>			0.355 <i>0.000</i>	0.328 <i>0.000</i>	0.307 <i>0.000</i>
Covid Dummy (2020-1)		-0.265 <i>0.000</i>		-0.308 <i>0.000</i>			0.093 <i>0.000</i>		0.026 <i>0.174</i>	
Ln Real On-trade Price, Covid Dummy					0.249 <i>0.052</i>					-0.2544 <i>0.007</i>
Ln Real Off-Trade Price, Covid Dummy					-0.172 <i>0.178</i>					0.2506 <i>0.007</i>
Ln Real GDP per Capita, Covid Dummy					-0.120 <i>0.000</i>					0.0202 <i>0.038</i>
Log-Likelihood	<i>135.53</i>	<i>187.790</i>	<i>136.820</i>	<i>194.380</i>	<i>206.930</i>	<i>251.78</i> <i>0</i>	<i>264.470</i>	<i>292.490</i>	<i>293.490</i>	<i>298.520</i>
Likelihood Ratio Test		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.068</i>	(3) vs (4) <i>0.000</i>	(3) vs (5) <i>0.000</i>		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.104</i>	(3) vs (5) <i>0.003</i>

Note: Coefficients with P-Values below in Italics, Fixed Effects Panel regression

Table A.5: On and Off-Trade Sales Volume per Capita – Western Europe

	On Trade Vol per Capita					Off trade Vol per Capita				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	-2.611 <i>0.000</i>	-3.089 <i>0.000</i>	-1.855 <i>0.000</i>	-3.022 <i>0.000</i>	-3.127 <i>0.000</i>	-2.980 <i>0.000</i>	-2.896 <i>0.000</i>	-2.633 <i>0.000</i>	-2.411 <i>0.000</i>	-2.4313 <i>0.000</i>
Ln Real On-trade Price	-0.244 <i>0.000</i>	-0.150 <i>0.001</i>	-0.204 <i>0.002</i>	-0.147 <i>0.002</i>	-0.202 <i>0.024</i>	-0.025 <i>0.294</i>	-0.042 <i>0.071</i>	-0.007 <i>0.795</i>	-0.017 <i>0.473</i>	-0.0562 <i>0.2101</i>
Ln Real Off-Trade Price	-1.137 <i>0.000</i>	-0.613 <i>0.000</i>	-1.132 <i>0.000</i>	-0.614 <i>0.000</i>	-0.648 <i>0.000</i>	-0.217 <i>0.002</i>	-0.309 <i>0.000</i>	-0.215 <i>0.002</i>	-0.313 <i>0.000</i>	-0.272 <i>0.000</i>
Ln Real per Capita			-0.210 <i>0.093</i>	-0.018 <i>0.840</i>	0.030 <i>0.749</i>			-0.097 <i>0.047</i>	-0.133 <i>0.004</i>	-0.1266 <i>0.009</i>
Covid Dummy (2020-1)		-0.390 <i>0.000</i>		-0.389 <i>0.000</i>			0.069 <i>0.000</i>		0.074 <i>0.000</i>	
Ln Real On-trade Price, Covid Dummy					-0.020 <i>0.770</i>					0.0504 <i>0.150</i>
Ln Real Off-Trade Price, Covid Dummy					0.138 <i>0.066</i>					-0.0745 <i>0.050</i>
Ln Real GDP per Capita, Covid Dummy					-0.122 <i>0.000</i>					0.0209 <i>0.000</i>
Log-Likelihood	<i>98.43</i>	<i>189.850</i>	<i>99.964</i>	<i>189.870</i>	<i>185.510</i>	<i>353.62</i> <i>0</i>	<i>367.890</i>	<i>355.750</i>	<i>372.330</i>	<i>370.680</i>
Likelihood Ratio Test		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.049</i>	(3) vs (4) <i>0.000</i>	(3) vs (5) <i>0.000</i>		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.023</i>	(3) vs (4) <i>0.000</i>	(3) vs (5) <i>0.000</i>

Note: Coefficients with P-Values below in Italics, Fixed Effects Panel regression

Table A.6: On and Off-Trade Sales Volume per Capita – Africa

	On Trade Vol per Capita					Off trade Vol per Capita				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	-5.459 <i>0.000</i>	-5.348 <i>0.000</i>	-6.938 <i>0.000</i>	-6.734 <i>0.000</i>	-6.593 <i>0.000</i>	-5.256 <i>0.000</i>	-5.272 <i>0.000</i>	-6.465 <i>0.000</i>	-6.505 <i>0.000</i>	-6.596 <i>0.000</i>
Ln Real On-trade Price	0.250 <i>0.006</i>	0.270 <i>0.001</i>	0.125 <i>0.158</i>	0.153 <i>0.064</i>	0.164 <i>0.043</i>	0.562 <i>0.000</i>	0.559 <i>0.000</i>	0.461 <i>0.000</i>	0.455 <i>0.000</i>	0.490 <i>0.000</i>
Ln Real Off-Trade Price	-0.424 <i>0.000</i>	-0.488 <i>0.000</i>	-0.356 <i>0.000</i>	-0.422 <i>0.000</i>	-0.442 <i>0.000</i>	-0.733 <i>0.000</i>	-0.723 <i>0.000</i>	-0.677 <i>0.000</i>	-0.664 <i>0.000</i>	-0.686 <i>0.000</i>
Ln Real per Capita			0.387 <i>0.000</i>	0.362 <i>0.000</i>	0.332 <i>0.000</i>			0.317 <i>0.000</i>	0.322 <i>0.000</i>	0.331 <i>0.000</i>
Covid Dummy (2020-1)		-0.243 <i>0.000</i>		-0.233 <i>0.000</i>			0.036 <i>0.207</i>		0.045 <i>0.095</i>	
Ln Real On-trade Price, Covid Dummy					-0.239 <i>0.000</i>					-0.089 <i>0.012</i>
Ln Real Off-Trade Price, Covid Dummy					0.226 <i>0.000</i>					0.054 <i>0.154</i>
Ln Real GDP per Capita, Covid Dummy					-0.008 <i>0.398</i>					0.044 <i>0.000</i>
Log-Likelihood	<i>54.926</i>	<i>83.556</i>	<i>73.504</i>	<i>102.480</i>	<i>112.990</i>	<i>129.27</i> <i>0</i>	<i>130.130</i>	<i>147.920</i>	<i>149.420</i>	<i>162.700</i>
Likelihood Ratio Test		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.000</i>	(3) vs (5) <i>0.000</i>		(1) vs (2) <i>0.129</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.051</i>	(3) vs (5) <i>0.000</i>

Note: Coefficients with P-Values below in Italics, Fixed Effects Panel regression

Table A.6: On and Off-Trade Sales Volume per Capita – South America

	On Trade Vol per Capita					Off trade Vol per Capita				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	-3.151 <i>0.000</i>	-3.634 <i>0.000</i>	-4.294 <i>0.000</i>	-5.045 <i>0.000</i>	-4.9991 <i>0.000</i>	-3.290 <i>0.000</i>	-3.202 <i>0.000</i>	-4.958 <i>0.000</i>	-4.874 <i>0.000</i>	-4.757 <i>0.000</i>
Ln Real On-trade Price	-0.448 <i>0.000</i>	-0.088 <i>0.236</i>	-0.574 <i>0.000</i>	-0.221 <i>0.002</i>	-0.4201 <i>0.000</i>	0.673 <i>0.000</i>	0.607 <i>0.000</i>	0.490 <i>0.000</i>	0.450 <i>0.000</i>	0.405 <i>0.000</i>
Ln Real Off-Trade Price	-0.058 <i>0.547</i>	-0.186 <i>0.020</i>	-0.172 <i>0.076</i>	-0.330 <i>0.000</i>	-0.2641 <i>0.001</i>	-0.752 <i>0.000</i>	-0.728 <i>0.000</i>	-0.917 <i>0.000</i>	-0.900 <i>0.000</i>	-0.862 <i>0.000</i>
Ln Real per Capita			0.362 <i>0.000</i>	0.439 <i>0.000</i>	0.4917 <i>0.000</i>			0.529 <i>0.000</i>	0.520 <i>0.000</i>	0.498 <i>0.000</i>
Covid Dummy (2020-1)		-0.329 <i>0.000</i>		-0.347 <i>0.000</i>			0.060 <i>0.065</i>		0.039 <i>0.184</i>	
Ln Real On-trade Price, Covid Dummy					-0.0188 <i>0.749</i>					0.114 <i>0.059</i>
Ln Real Off-Trade Price, Covid Dummy					0.0475 <i>0.415</i>					-0.108 <i>0.072</i>
Ln Real GDP per Capita, Covid Dummy					-0.0696 <i>0.000</i>					0.009 <i>0.304</i>
Log-Likelihood	<i>98.19</i> 8	<i>151.560</i>	<i>108.360</i>	<i>175.230</i>	<i>169.770</i>	<i>128.09</i> 0	<i>129.940</i>	<i>157.580</i>	<i>158.540</i>	<i>164.170</i>
Likelihood Ratio Test		(1) vs (2) <i>0.000</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.000</i>	(3) vs (5) <i>0.000</i>		(1) vs (2) <i>0.033</i>	(1) vs (3) <i>0.000</i>	(3) vs (4) <i>0.110</i>	(3) vs (5) <i>0.002</i>

Note: Coefficients with P-Values below in Italics, Fixed Effects Panel regression