

Tbilisi 2022 Abstract Submission

Title

Estimation of alcohol demand elasticity: Consumption of beer, wine, and spirits at home and away of home

I want to submit an abstract for:

Conference Presentation

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Keywords

demand analysis; QUAIDS; on-trade; off-trade; selectivity; quality-adjusted price; price elasticity; income elasticity

Research Question

Are alcohol consumers price and income responsive?

Are wine, beer, and spirits mutual weak substitutes?

Are consumption of alcohol on-trade (away of home) and off-trade (at home) substitutes?

Methods

Econometrically estimated Quadratic Almost Ideal Demand System, controlling for censoring by two-step estimation procedure for a system of censored equations, using quality-adjusted (unit) price of wine, beers, and spirits.

Results

We estimated income elasticity, own-price and cross-price (Marshallian and Hicksian) elasticities for six alcohol products (wine, beer, spirits, on-trade and off-trade), see the estimation results in the attached file.

Abstract

The majority of prior research on alcohol demand has aimed at the consumption of beer, wine, and spirits either consumed on-trade (away of home) or off-trade (at home). Most of these studies found that alcohol consumers are sensitive to their price, alcohol products seem to be mutual imperfect substitutes, and consumption reacts positively to income. In some cases, however, the income elasticity of demand for alcohol at home is negative,

rather than positive, indicating that with increasing income consumers might switch from off-trade to on-trade consumption (e.g., Heien & Pompelli, 1989).

The behavior of alcohol consumers on off-trade and on-trade might be different, as some may prefer to consume alcohol in pubs, while others might prefer the opposite. Consumers may also switch between the two markets if prices and/or income change. Since most consumer expenditure surveys are usually designed in a way that they only contain information about alcohol consumption at home (off-trade) or aggregated consumption at home and away from home, estimating demand relying on such limited information might lead to an incomplete behavioral model and hence not yield accurate estimates.

In contrast to the majority of previous studies, we analyze alcohol household demand, addressing specifically a substitution between on-trade and off-trade consumption of beer, wine, and spirits. We use household-level data from the Czech Consumer Expenditure Survey that records household expenditures on alcohol separately for these two different markets.

We estimate the Quadratic Almost Ideal Demand System (Banks et al., 1997) that consists of six alcohol categories (beer, wine, spirits, on-trade and off-trade). Since censoring is relevant to alcohol products, we pay special attention to treating the selectivity (i.e. zero consumption), following Heien & Wessells's (1990) two-step estimation procedure for a system of censored equations. Finally, since unit values for each beverage are calculated by dividing expenditure by quantities, these values may also reflect differences in quality (like brand, marketing services, organic production, and many others). To correct for the quality, we adjust unit values and use the quality-adjusted price in demand analysis, following Cox & Wohlgenant (1986).

We find that the income elasticity is between 1.36-1.85 for on-trade and 0.89 -1.00 for off-trade (with an exemption for spirits consumed at home, 0.34). Alcohol consumers in the Czech Republic do respond to prices, with own price uncompensated (Marshallian) elasticity between -0.32 and -1.61, when beer on-trade consumption (away of home) is the most price sensitive (-1.61), whilst consumers of wine and spirits off-trade (at home) are the least price responsive (-0.32 and -0.34). Compensated (Hicksian) own price elasticities are in a range of -0.26 to -1.33. Regarding the cross-price effects, beer and wine are weak substitutes for spirits at off-trade. On the on-trade market, we find a strong cross-price negative effect for consumption of spirits w.r.t. price. Between on-trade and off-trade markets, off-market (at home) consumption of beer and wine is positively associated with the price of beer on-trade (i.e. there are weak substitutes). All three alcohol products consumed on-trade (away of home) are also weak substitutes to beer priced and consumed off-market. The same holds for beer consumed away of home that is weak substitute for wine consumed at home.

Last, since censoring is relevant for most alcohol products, we investigated whether it matters which equation is selected as redundant (and hence omitted in QUAIDS). In fact, this decision matters. We found the absolute magnitude of own-price elasticity for a product for which the budget-share equation was omitted seems to be larger compared to all other estimates derived from the demand system that includes the equation for this product. Second, the price elasticity is more than 50% for wine on-trade and even 1.5-times larger for spirits on-trade for the systems where these two products are omitted (compared to the estimates derived from QUAIDS that contain these products).

Literature:

- Banks, J., Blundell, R., & Lewbel, A. (1997). Quadratic Engel Curves and Consumer Demand. *Review of Economics and Statistics*, 79(4), 527-539. <https://doi.org/10.1162/003465397557015>
- Cox, T. L., & Wohlgenant, M. K. (1986). Prices and Quality Effects in Cross-Sectional Demand Analysis. *American Journal of Agricultural Economics*, 68(4), 908-919. <https://doi.org/10.2307/1242137>
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Estimation of alcohol demand elasticity: Consumption of beer, wine, and spirits at home and away of home

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The majority of prior research on alcohol demand has aimed at the consumption of beer, wine, and spirits either consumed on-trade (away of home) or off-trade (at home). Most of these studies found that alcohol consumers are sensitive to their price, alcohol products seem to be mutual imperfect substitutes, and consumption reacts positively to income. In some cases, however, the income elasticity of demand for alcohol at home is negative, rather than positive, indicating that with increasing income consumers might switch from off-trade to on-trade consumption (e.g., Heien & Pompelli, 1989).

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Last, since censoring is relevant for most alcohol products, we investigated whether it matters which equation is selected as redundant (and hence omitted in QUAIDS). In fact, this decision matters.¹

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¹ We found the absolute magnitude of own-price elasticity for a product for which budget-share equation was omitted seems to be larger compared to all other estimates derived from the demand system that includes the equation for this product. Second, the price elasticity is more than 50% for wine on-trade and even 1.5-times larger for spirits on-trade for the systems where these two products are omitted (compared to the estimates derived from QUAIDS that contain these products).

Table: Estimation results, QUAIDS, income and uncompensated (Marshallian) price elasticities.

	Coeff.	z stat	P>z
<i>Income elasticities</i>			
beerON	1.853	59.680	0.000
beerOFF	1.005	53.830	0.000
otherON	1.363	18.150	0.000
otherOFF	0.336	13.700	0.000
wineON	1.524	27.890	0.000
wineOFF	0.885	40.220	0.000
<i>Uncompensated price elasticities</i>			
e11u beerON	-1.613	-37.850	0.000
e12u	0.082	2.430	0.015
e13u	0.011	0.890	0.371
e14u	-0.190	-6.590	0.000
e15u	-0.075	-3.860	0.000
e16u	-0.067	-2.580	0.010
e21u	0.150	9.480	0.000
e22u beerOFF	-1.211	-54.330	0.000
e23u	0.007	1.350	0.176
e24u	-0.071	-4.730	0.000
e25u	0.033	4.150	0.000
e26u	0.086	5.650	0.000
e31u	-0.059	-0.570	0.571
e32u	0.010	0.120	0.908
e33u otherON	-0.344	-4.940	0.000
e34u	-0.326	-3.680	0.000
e35u	-0.360	-4.820	0.000
e36u	-0.285	-4.160	0.000
e41u	0.071	3.250	0.001
e42u	0.068	3.160	0.002
e43u	-0.035	-4.420	0.000
e44u otherOFF	-0.527	-19.680	0.000
e45u	-0.063	-5.230	0.000
e46u	0.149	7.790	0.000
e51u	-0.242	-3.060	0.002
e52u	0.108	1.720	0.086
e53u	-0.155	-4.440	0.000
e54u	-0.501	-7.850	0.000
e55u wineON	-0.323	-4.260	0.000
e56u	-0.412	-8.120	0.000
e61u	0.154	10.020	0.000
e62u	0.133	7.580	0.000
e63u	-0.012	-2.580	0.010

e64u	-0.047	-3.200	0.001
e65u	-0.028	-3.820	0.000
e66u wineOFF	-1.085	-53.630	0.000
Price compensated (Hicksian) elast.			
e11c beerON	-1.331	-31.810	0.000
e12c	0.670	20.540	0.000
e13c	0.046	3.880	0.000
e14c	0.167	5.820	0.000
e15c	0.001	0.070	0.948
e16c	0.446	17.920	0.000
e21c	0.303	19.850	0.000
e22c beerOFF	-0.891	-41.160	0.000
e23c	0.026	5.230	0.000
e24c	0.123	8.360	0.000
e25c	0.074	9.500	0.000
e26c	0.365	25.490	0.000
e31c	0.148	1.450	0.148
e32c	0.443	5.320	0.000
e33c otherON	-0.317	-4.570	0.000
e34c	-0.063	-0.720	0.473
e35c	-0.304	-4.070	0.000
e36c	0.093	1.390	0.164
e41c	0.122	5.820	0.000
e42c	0.175	8.680	0.000
e43c	-0.028	-3.590	0.000
e44c otherOFF	-0.462	-17.230	0.000
e45c	-0.049	-4.100	0.000
e46c	0.242	13.450	0.000
e51c	-0.010	-0.130	0.893
e52c	0.593	9.620	0.000
e53c	-0.126	-3.600	0.000
e54c	-0.207	-3.280	0.001
e55c wineON	-0.260	-3.440	0.001
e56c	0.010	0.210	0.832
e61c	0.289	20.040	0.000
e62c	0.414	25.500	0.000
e63c	0.005	1.090	0.274
e64c	0.124	8.530	0.000
e65c	0.008	1.140	0.254
e66c wineOFF	-0.840	-42.970	0.000

Note: eXXu describes the estimates of uncompensated (Marshallian) elasticities; numbers 1,2,3,4,5, and 6 denotes (in order) beer on-trade, beer off-trade, spirits on-trade, spirits off-trade, wine on-trade, and wine off-trade, so e31u describes the cross-price elasticity of consumption of spirits on-trade (i.e. 3) with respect to price of beer on-trade (i.e. 1).