Tax on Sugary Beverages: Socio-Economic Impact Analysis

Standing Committee on Finance

31 January 2017

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Introduction

- The primary objective of taxes is to raise revenue for the fiscus to fund government's expenditure priorities.

- "Free-rider problem" necessitate the imposition of taxes (unrequited and compulsory payments) to finance the provisions of "pure"-public goods and services.

- Externalities refer to situations when the production and/or consumption of goods and services imposes costs or benefits (on others) that are not reflected in the prices charged for the goods and services being provided and/or consumed. An external cost is often referred to as a negative externality while external benefits are classified as a positive externality.

- Therefore, and increasingly so, the tax system can also help to achieve social, health and environmental objectives in a more direct way by changing the relative prices of certain goods (and services) by making it either more expensive (taxes) to discourage (e.g. alcohol and tobacco, etc.) the consumption / use of such goods (and services).

The five determinants of Demand

1. The price of the good or service.
2. Prices of related goods or services. These are either complementary (purchased along with) or substitutes (purchased instead of).
3. Income of buyers.
4. Tastes or preferences of consumers.
5. Expectations. These are usually about whether the price will go up.
   AND
   For aggregate demand, the number of buyers in the market is the sixth determinant.

Demand Equation or Function

- This equation expresses the relationship between demand and its five determinants:
- $Qd = f$ (price, income, prices of related goods, tastes, expectations)
- It says that the quantity demanded of a product is a function of its price, the income of the buyer, the price of related goods (substitutes or complements), the tastes of the consumer, and any expectation the consumer has of future supply, prices, etc.

Demand curve: price and income elasticity of demand

- The quantity demand of a good or service is generally inversely related to the (own) price thereof.

- The resulting demand curve is downward slopping; a higher price is associated with a lower quantity demanded and vice versa.

- In addition to (own) price the quantity demand is also a function of the prices of other goods and service (be they substitutes or complementary), income, and other external variables that are more difficult to measure such as taste, status, etc.

- The responsiveness of the quantity demanded to changes in prices or income are respectively referred to as the price and income elasticity of demand.

Demand curve
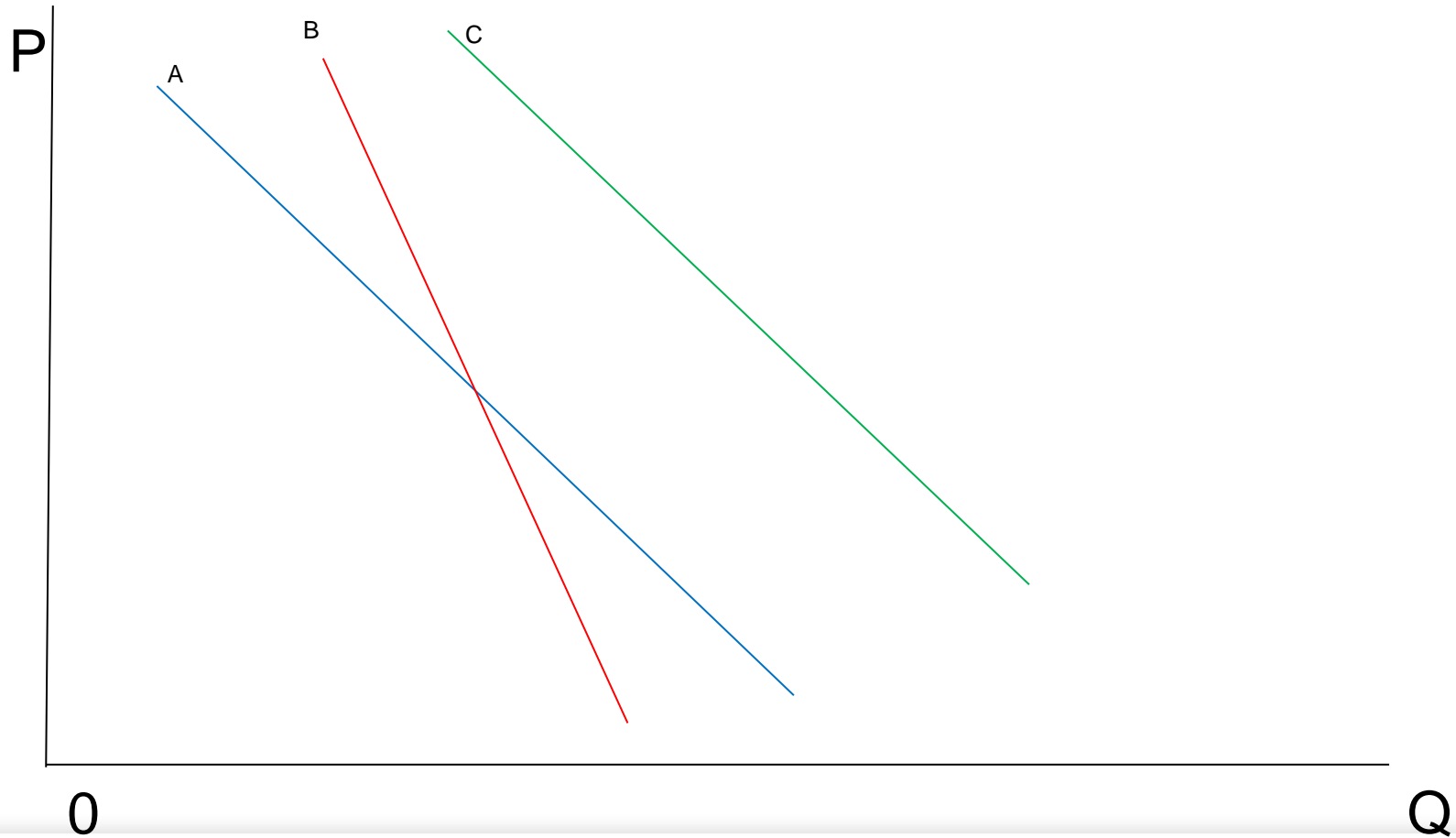
Cross price elasticity of demand

- The **cross-price elasticity of demand** measures the responsiveness of the quantity demanded for a good to a change in the **price** of another good, ceteris paribus.

- The cross-price elasticity of demand measures the change in demand for one good in response to a change in price of another good.

  Source: Boundless. "Cross-Price Elasticity of Demand." *Boundless Economics*. Boundless, 20 Sep. 2016. Retrieved 08 Nov. 2016 from https://www.boundless.com/economics/textbooks/boundless-economics-textbook/elasticity-and-its-implications-6/other-demand-elasticities-55/cross-price-elasticity-of-demand-212-12303/

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Methodology (1)

Purpose of the analysis

- To estimate the socio-economic impact of imposing a tax on sugary beverages in South Africa

How was the analysis done?

- Analyse the beverage market by means of descriptive analysis:

  - Quantity of soft drinks sold in the market and what does this amount to?
  - Change in soft drinks prices over time in response to quantity demanded?
  - What percentage of the beverage market is taxable?
  - Which companies own the largest share of the soft drinks market?
  - How many people are employed by the beverage industry?

- Own and cross-price elasticities are estimated by applying a double-log model using the Ordinary Least Squares (OLS) method (exclude possible taxable beverages).

- National Treasury's multiplier and computable general equilibrium (CGE) models are used to highlight the effect on overall output in the economy

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Methodology (2)

Own and cross-price elasticities

- Own price elasticities are important to determine the impact on consumer behaviour or responsiveness to price changes due to a sugary tax.

- Cross-price elasticities are important to determine the magnitude of a substitution effect.

- Income elasticities are also important since the demand for goods or services is a function of real disposable income. Hence, income elasticities are also taken into account.

- Estimate decline in volumes and revenue.

- The impact on volume and value including the use of cross-price elasticities are important (not just own price and income, but also substitution effect).

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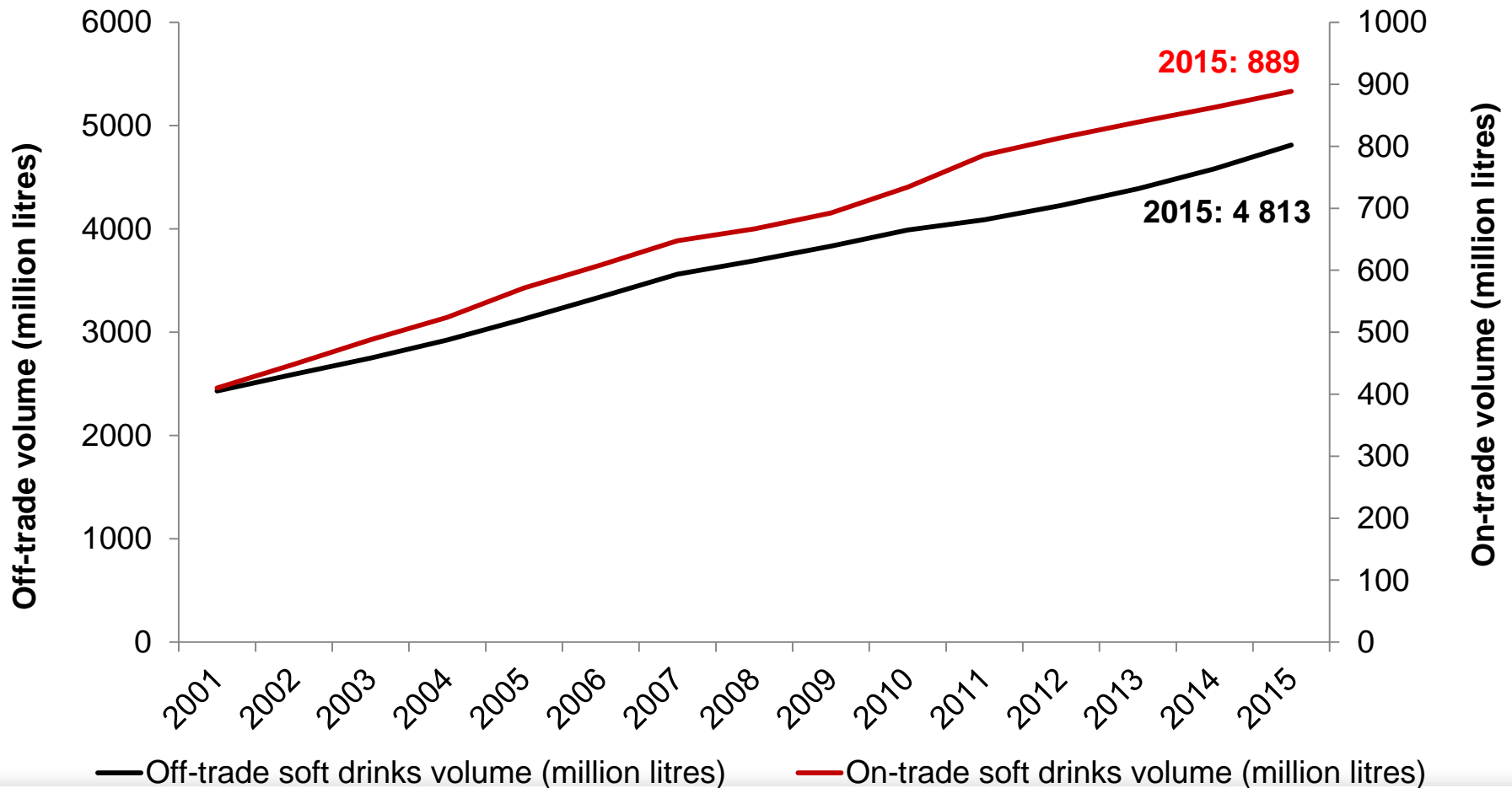National Treasury
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Data sources

Data sources used

- Euromonitor: Soft drink industry volumes, values, prices, national brand owner, national brand owner share, distribution outlets, 2015.

- SARB: Real disposable household income,

- StatsSA: Input-output tables (2013), AFS P0021 (2014)

- Quantec: Output and employment

- QES: Non-formal agriculture employment P0044
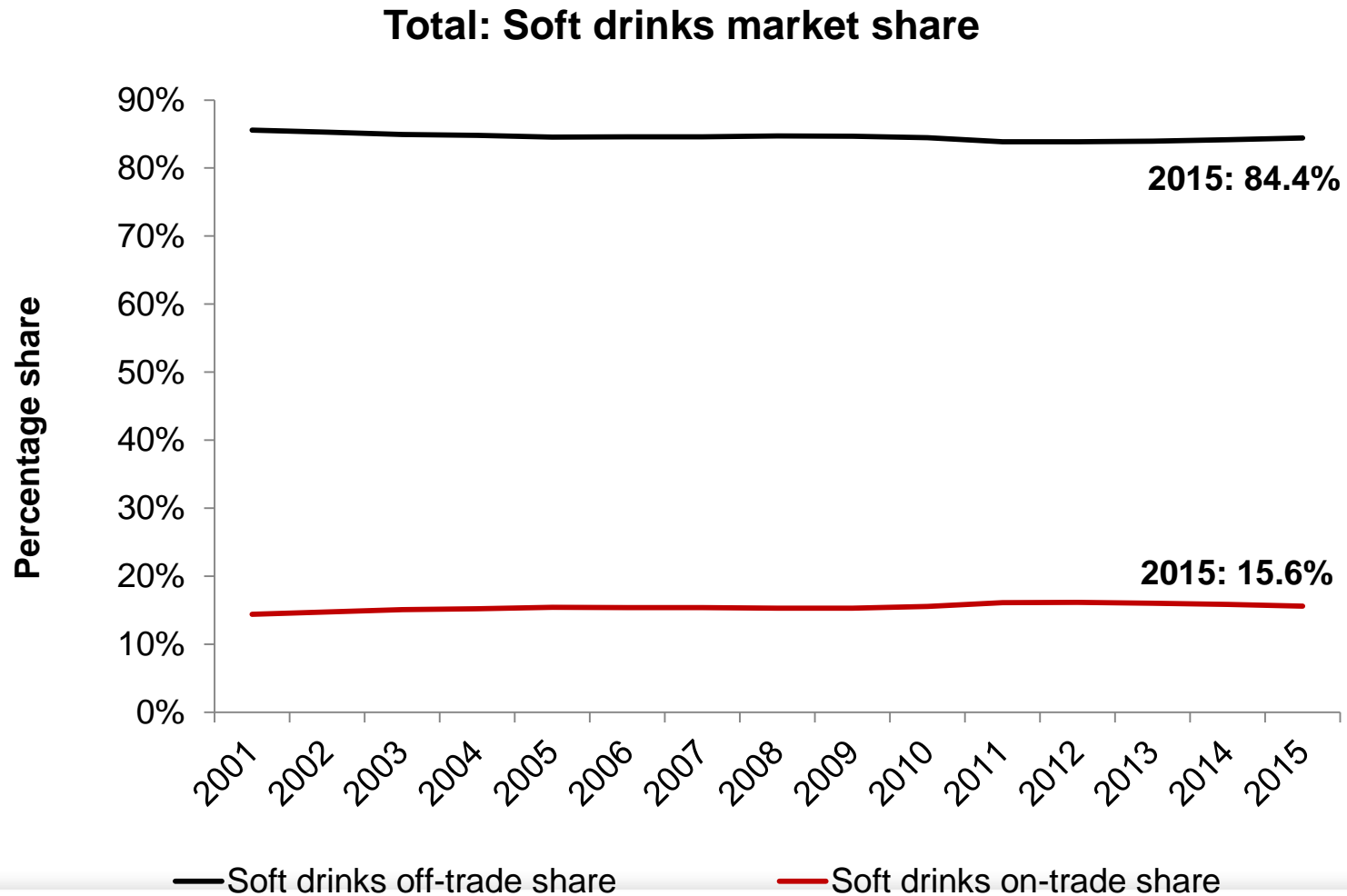
Overview of the beverage market
Soft drinks

Total : Soft drinks volumes (million litres) – Off-trade (lhs)

2015: 889

2015: 4 813

Off-trade soft drinks volume (million litres) — On-trade soft drinks volume (million litres)

Overview of the beverage market
Soft drinks

Total: Soft drinks market share

2015: 84.4%

2015: 15.6%

Percentage share

━━━ Soft drinks off-trade share   ━━━ Soft drinks on-trade share

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Overview of the beverage market
Soft drinks

Total: Soft drinks prices per litre (constant 2015 prices)
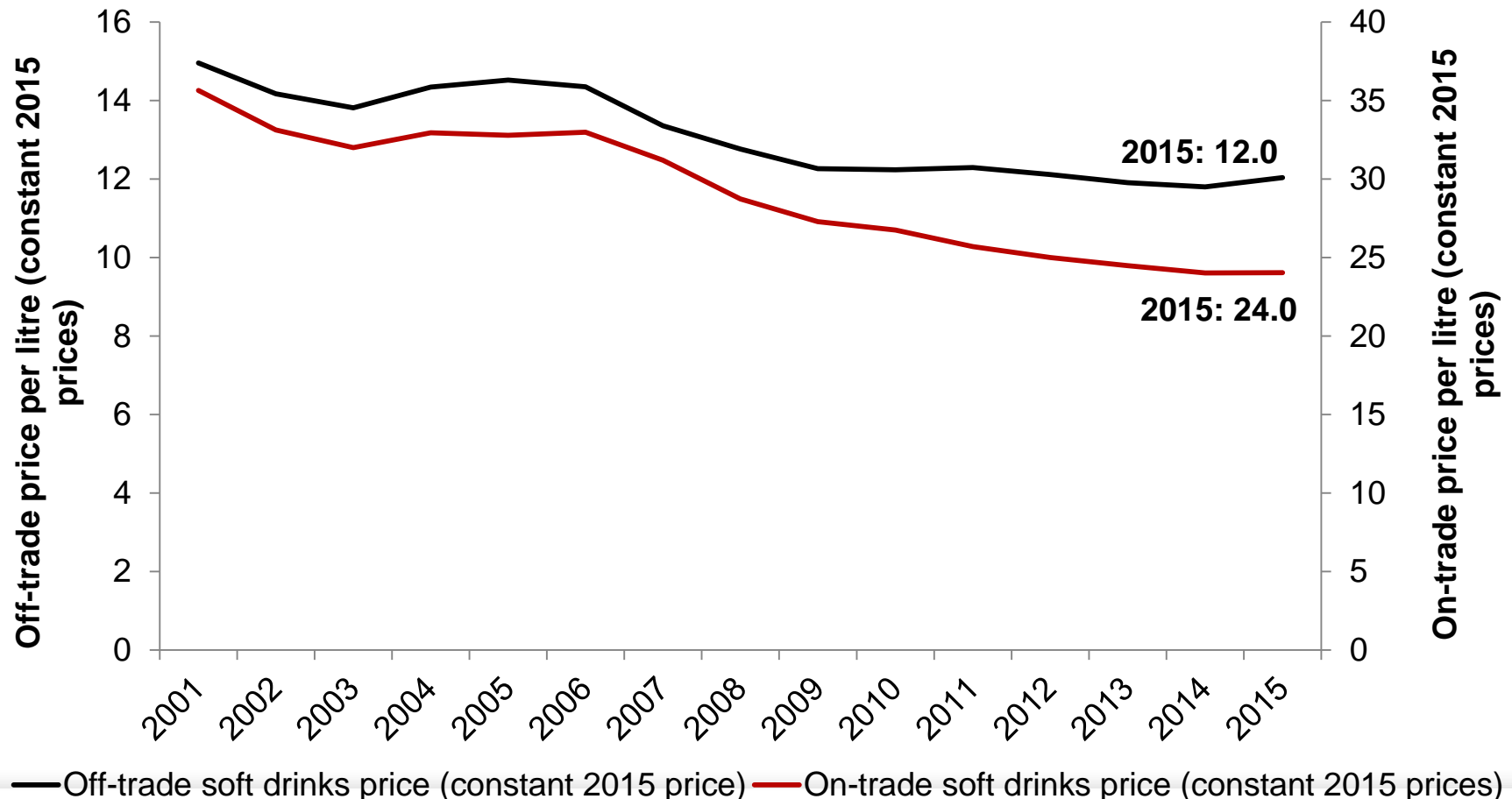
2015: 12.0

2015: 24.0

Off-trade price per litre (constant 2015 prices)

On-trade price per litre (constant 2015 prices)

━━ Off-trade soft drinks price (constant 2015 price) ━━ On-trade soft drinks price (constant 2015 prices)

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Total Soft Drinks market in South Africa:

Volume and Real Revenue growth : 2001 to 2015		
	Off-trade	On-trade
Volume		
2015: 5 702 million litres		
2001 to 2015 Cum	98%	117%
Cum average per year	5.0%	5.7%
Real Revenue – 2015 prices (real)		
2015: R79 296 million		
2001 to 2015 Cum	59%	46%
Cum average per year	3.4%	2.7%

% Share	Off-trade	On-trade
Volume	85%	15%
Real Revenue - 2015	71%	29%

Price (real 2015 prices) vs. Quantity demanded – Total Soft Drinks Market (South Africa)

Price per litre (2015 prices) & Volume (mn) - Soft Drinks - Off Trade (2001 to 2015)

Price per litre (2015 prices) & Volume (mn) - Soft Drinks - On Trade (2001 to 2015)
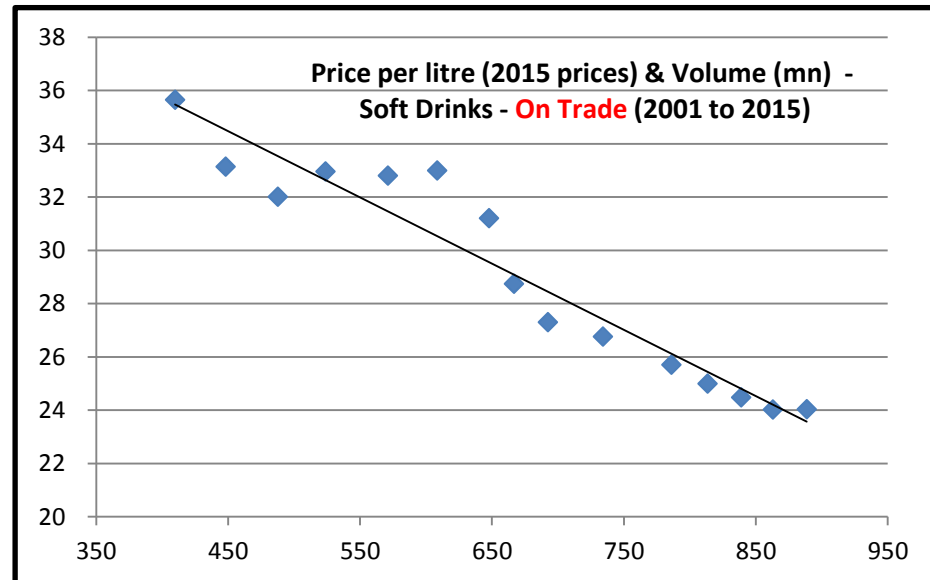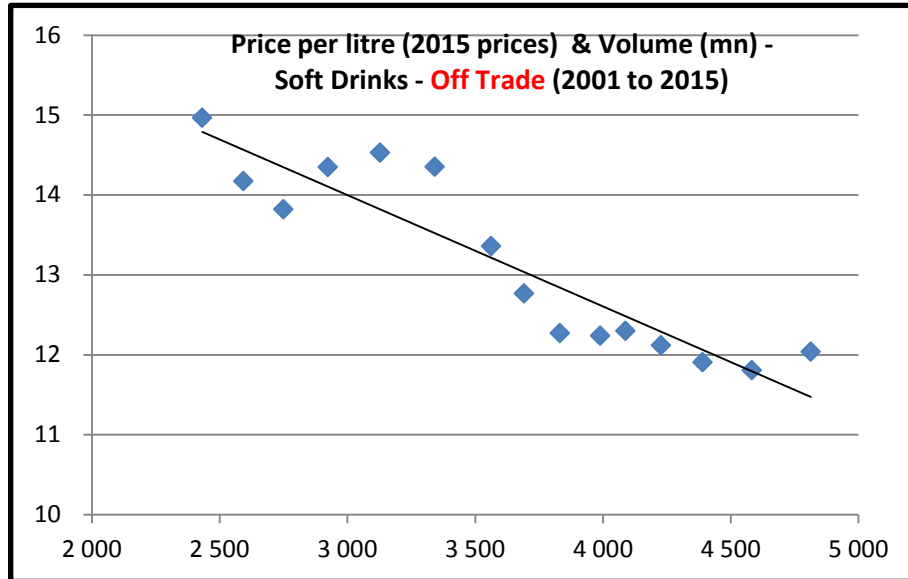
Price (real 2015 prices) vs. Quantity demanded –
Carbonates, Cola Carbonates, Juice & Bottled Water
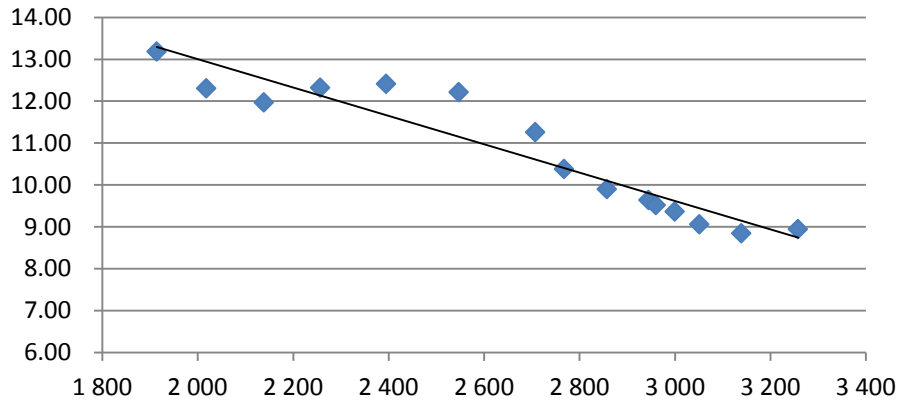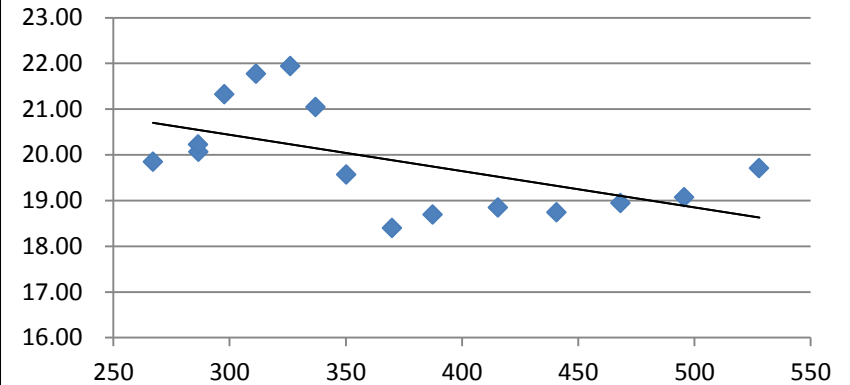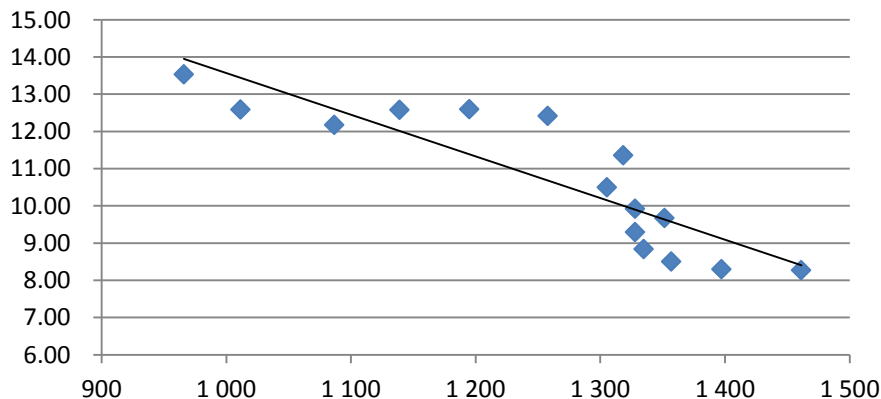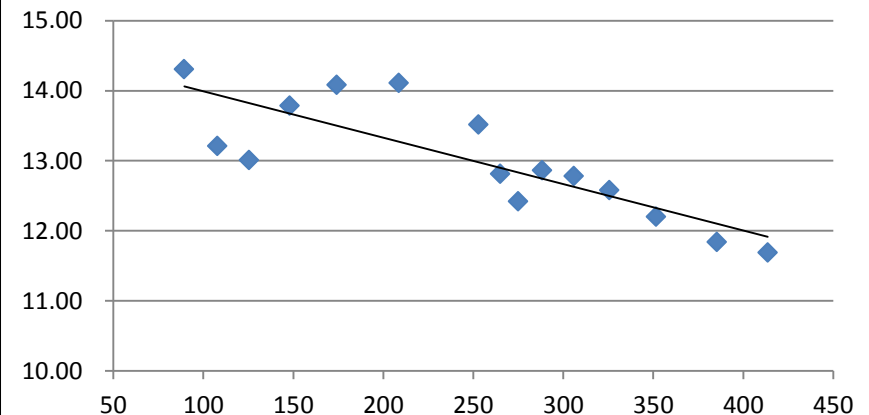
Own, Cross-price & Income elasticities

- The cross-price elasticities are calculated to determine the magnitude of the estimated substitution that will take place given the sugary tax.
- Considered substitute products are: (a) 100% fruit juice and (b) low calorie cola carbonates (diet drinks).
- The model is specified as:

$$\log(Y_t) = \alpha + \beta_1 logX_{1t} + \beta_2 \log(X_{2t}) + \beta_3 \log(X_{3t}) + \varepsilon_t$$

Where:

$\log(Y_t)$: natural logarithm of quantity

α: intercept

β_1: elasticity of price variable

$\log(X_{1t})$: natural logarithm of price

β_2: elasticity of income variables

$\log(X_{2t})$: natural logarithm of income

β_3: elasticity of substitute

$\log(X_{3t})$: natural logarithm of substitute price   & ε_t: error term

Own, Cross-price & Income elasticities

	Own, Cross price & income elasticities					
	Carbonates	Disposable household income	100% juice	Carbonates	Disposable household income	Low calorie cola carbonates
Elasticity	-0.77	0.85	0.53	-0.59	0.97	0.44
p-value	0.00*	0.00*	0.02*	0.00*	0.00*	0.10*
t-value	-4.61**	4.49**	2.75**	-3.81**	4.61**	1.81**
Adjusted R-squared	0.992			0.985		

- The own price elasticity for carbonates is -0.77 and the cross-price elasticity with 100% juice is +0.53 (a possible substitute). The income elasticity is +0.85

- Thus, if the price of the substitute product, 100% juice, increases by 10%, the quantity demanded of carbonates will increase by 5.3%.

- The own price elasticity for carbonates is -0.77 and the cross-price elasticity with low calorie cola carbonates (diet drinks) (a possible substitute) is +0.44. The income elasticity of carbonates is +0.97.

- A 10% increase in the price of low calorie cola carbonates will result in a 4.4% increase in the quantity demanded of carbonates.

Impact - formal sector volumes/values Including cross-price elasticity (diet drinks)

Formal distribution channel off-trade volumes/ values (million litres/ Rand millions) excluding possible substitutes (adjusted carbonates)	Volume			Value		
	Pre-tax	Post-tax	Variance between pre and post tax (million litres)	Pre-tax	Post-tax	Variance between pre and post tax (R' million)
Convenience Stores	321.1	287.9	-33.2	2871.2	2712.0	-159.2
Discounters	51.7	46.3	-5.3	461.9	436.3	-25.6
Forecourt Retailers	216.2	193.9	-22.3	1933.5	1826.3	-107.2
Hypermarkets	132.6	118.9	-13.7	1185.3	1119.6	-65.7
Supermarkets	1673.6	1500.8	-172.9	14965.4	14135.7	-829.6
Mixed Retailers	72.1	64.7	-7.5	645.1	609.3	-35.8
Non-Grocery Specialists	287.3	257.6	-29.7	2568.8	2426.4	-142.4
Vending	3.5	3.1	-0.4	31.1	29.4	-1.7
Homeshopping	0.0	0.0	0.0	0.0	0.0	0.0
Internet Retailing	9.3	8.3	-1.0	82.9	78.3	-4.6
Direct Selling	0.0	0.0	0.0	0.0	0.0	0.0
Total formal off-trade carbonates	2767.4	2481.5	-285.9	24745.3	23373.5	-1371.8
Total off-trade carbonates	3100.5	2780.2	-320.3	27724.2	26187.3	-1536.9

- By taking the substitution effect between carbonates and low calorie cola carbonates into account, the formal sector will experience a decline in about 286 million litres.

- This amounts to an estimated decline in revenue of R1.4 billion.

Impact - informal sector volumes/values Including cross-price elasticity (diet drinks)

Informal distribution channel off-trade volumes/value (million litres/ Rand millions) excluding possible substitutes (adjusted carbonates)	Volume			Value		
	Pre-tax	Post-tax	Variance between pre and post tax (million litres)	Pre-tax	Post-tax	Variance between pre and post tax (R' millions)
Food/drink/tobacco specialists	65.4	58.6	-6.8	584.6	552.2	-32.4
Independent Small Grocers	155.6	139.5	-16.1	1391.5	1314.4	-77.1
Other Grocery Retailers	112.2	100.6	-11.6	1003.3	947.7	-55.6
Total informal off-trade carbonates	333.2	298.8	-34.4	2979.5	2814.3	-165.2
Total off-trade carbonates	3100.5	2780.2	-320.3	27724.2	26187.3	-1536.9

- By taking the substitution effect between carbonates and low calorie cola carbonates into account, the informal sector will experience a decline in 35 million litres, amounting to about R165 million.

Macroeconomic impact – Multiplier analysis

- Effect on overall output, given interlinkages between various sectors

- Direct and indirect impacts of an initial increase/decrease in aggregate demand for a sector, and also the induced effect

- 2012 SUT (StatsSA); 59 sectors; Leontief multipliers (fixed proportion production function – linear model)

- Limitations of multiplier analysis means that results could be overstated
  - Does not fully account for income effect resulting from reduced consumption of taxable product

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Multiplier analysis (Including cross-price elasticity)

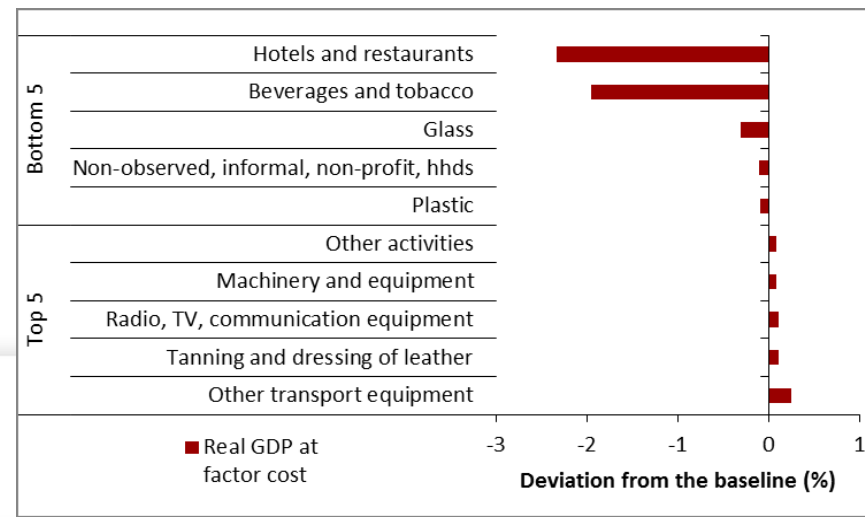- Taking substitution effects into account (also cross-price elasticities), reduction in sales values is lower:

    - R1.5 billion (Carbonates - with low calorie cola carbonates as a substitute)

- Impact on GDP and jobs is less severe – job losses at most around 5 000

- Assuming that the industry reformulate their products the net decline in volumes and job losses could be reduced significantly if not entirely prevented.

Computable General Equilibrium (CGE) analysis

- National Treasury CGE model used to estimate the potential impact of a 20% tax on the price of soft drinks

- Model calibrated to a 2012 social accounting matrix for South Africa

- Limitation of the analysis: consider soft drinks at aggregate level - tax applied to all soft drinks regardless of sugar content
  - These initial results are likely to be overstated;
  - Should give an indication of the impact of the tax on various sectors and households

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CGE results

- Higher prices discourage consumption of soft drinks – lower income households most affected (higher income elasticity of demand for soft drinks)

- Sectorally, negative effects on beverages and catering sectors

- Overall, the impact of the tax is negative, but relatively small
  - Real GDP is 0.02% lower compared to the no-tax baseline

- Model does not capture firm and consumer behavior at very specific product levels, and

- Health outcomes associated with the tax need to be factored into the overall assessment of the tax proposal

Chart (Bottom 5 / Top 5):

	Deviation from the baseline (%)
Bottom 5	
Hotels and restaurants	
Beverages and tobacco	
Glass	
Non-observed, informal, non-profit, hhds	
Plastic	
Top 5	
Other activities	
Machinery and equipment	
Radio, TV, communication equipment	
Tanning and dressing of leather	
Other transport equipment	

■ Real GDP at factor cost

Axis: -3 -2 -1 0 1
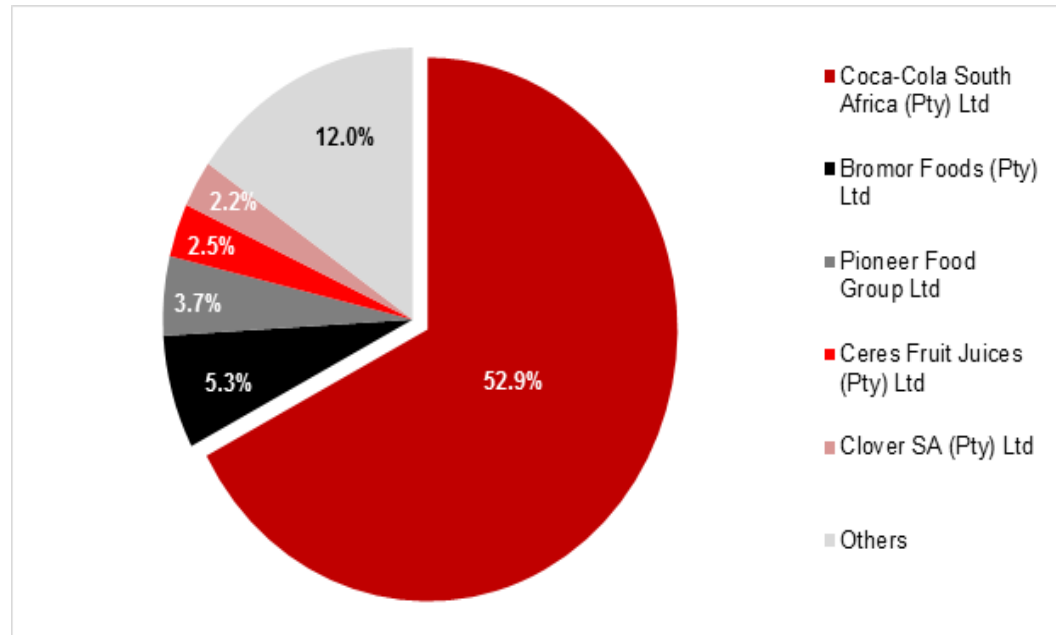
Deviation from the baseline (%)

Concluding remarks

- The National Treasury have managed to estimate prices and income elasticity of demand using South African data.
- The estimated impact of the sugary beverage tax is likely to be influenced:
  - Directly by the own-price elasticity of demand, but also the cross-price elasticity of demand.
  - In addition and very important the income elasticity of demand should also be take into account when estimating the net economic impact as the net demand is also a factor of changes in income levels
- When estimating the overall economic impact and not only the impact on the soft drinks industry the diversion of income to other products should also be incorporated
- Our initial analysis suggest that the net impact of a 2.29 c/gram sugar tax would result in a decline in volumes of between 13 and 15%
- The net negative economic impact is significantly lower when compared to the study by Oxford Economics

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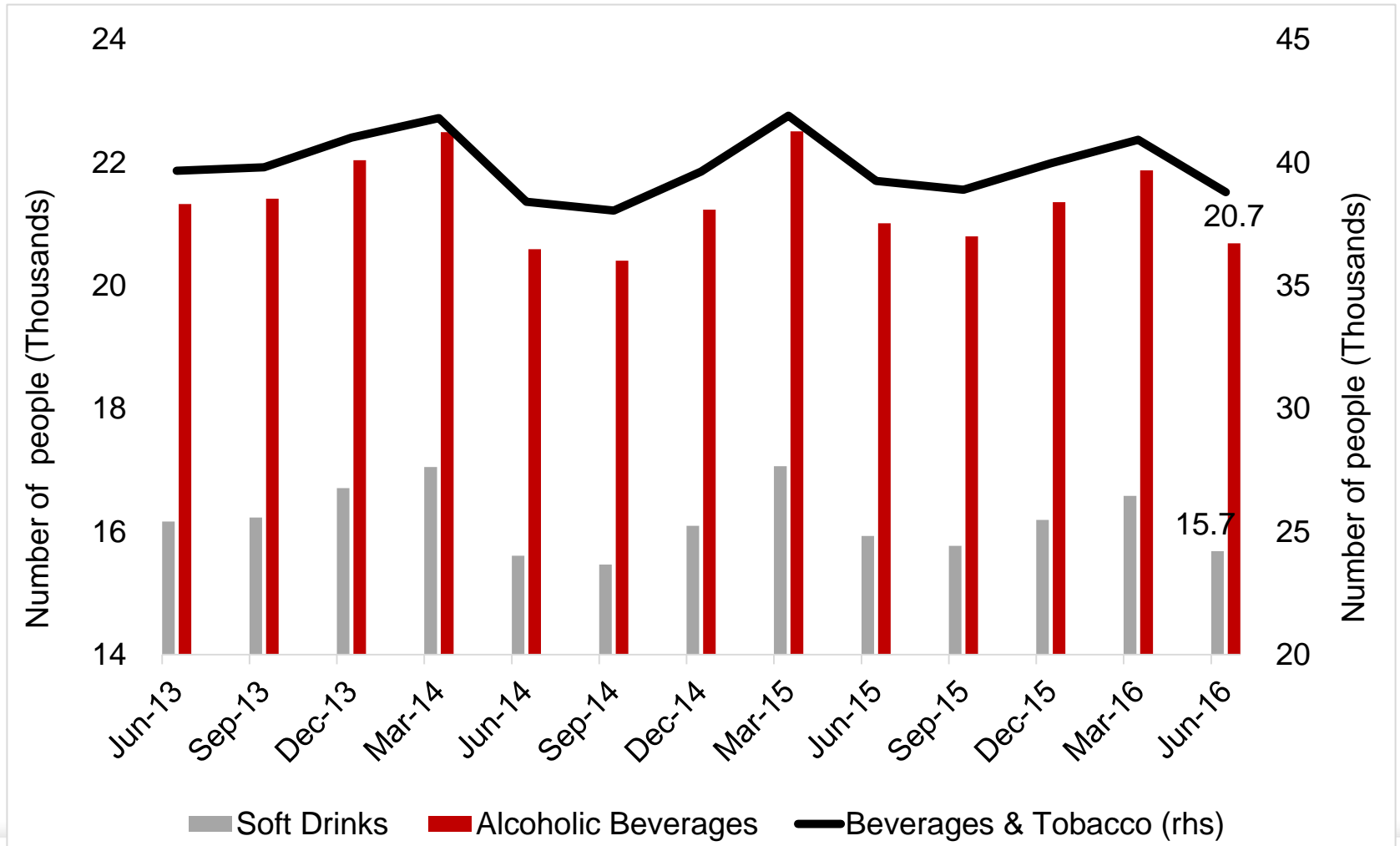National Treasury
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Thank you

Questions

Top 5 national brand owners share: soft drinks (2015)

Pie chart:
- Coca-Cola South Africa (Pty) Ltd: 52.9%
- Bromor Foods (Pty) Ltd: 5.3%
- Pioneer Food Group Ltd: 3.7%
- Ceres Fruit Juices (Pty) Ltd: 2.5%
- Clover SA (Pty) Ltd: 2.2%
- Others: 12.0%

- Coca-Cola South Africa the lead the soft drinks market in South Africa – especially in carbonates

- Carbonates = approx. 75% of soft drinks market

- Smaller players continue to expand their overall volume sales across most soft drink categories

Source: (Euromonitor, 2016)

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Employment – Beverages & Tobacco Sector

Overview of the beverage market Carbonates

Total: Carbonates volumes (million litres)

2015: 3258.3

2015: 774

Off-trade carbonates volumes (million litres)

On-trade carbonates volumes (million litres)

Total: Carbonates prices (constant 2015 prices)

2015: 8.9

2015: 22.4

Off-trade carbonates price per litre(constant 2015 prices)

On-trade carbonates prices per litre (constant 2015 prices)

—— Off-trade carbonates price (constant 2015 prices)   —— On-trade carbonates price (constnat 2015 prices)

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