Southern Africa Labour and Development Research Unit

How does a change in the excise tax on beer impact beer retail prices in South Africa?

by
Caitlan Russell and Corne van Walbeek

Working Paper Series
Number 162

About the Author(s) and Acknowledgments

Caitlan Russell and Corne van Walbeek - Postgraduate student and professor, respectively, in the School of Economics, University of Cape Town.

We thank Nicole Vellios and Evan Blecher and participants at the Postgraduate Conference for the three Western Cape universities for helpful comments and suggestions. We especially want to thank Sharon de Bruyns for excellent technical help in cleaning the data. We also thank Anita Voges and Marietjie Bennett from Statistics SA for making the data available. All errors and omissions are ours.

Recommended citation

Russell, C., van Walbeek, M. (2016). How does a change in the excise tax on beer impact beer retail prices in South Africa? A Southern Africa Labour and Development Research Unit Working Paper Number 162. Cape Town: SALDRU, University of Cape Town

---

ISBN: 978-1-928281-23-8

Working Papers can be downloaded in Adobe Acrobat format from www.saldru.uct.ac.za.
Printed copies of Working Papers are available for R25.00 each plus vat and postage charges.

Orders may be directed to:
The Administrative Officer, SALDRU, University of Cape Town, Private Bag, Rondebosch, 7701,
Tel: (021) 650 5696, Fax: (021) 650 5697, Email: brenda.adams@uct.ac.za

How does a change in the excise tax on beer impact beer retail prices in South Africa?

Caitlan Russell and Corne van Walbeek[1]

SALDRU Working Paper Number 162
University of Cape Town
January 2016

Abstract

This paper uses price data, collected by Statistics South Africa, to estimate the effect of a change in the excise tax on the retail price of beer. We find strong evidence that the excise tax on beer is overshifted to consumers. The pass-through coefficient is estimated at 4.83 (95% CI: 4.02; 5.64) for lager, and at 4.77 (95% CI: 4.04; 5.50) for all beer (which includes dark beer). This implies that for every R1/unit increase in the excise tax, the retail price increases by about R4.80/unit. Of the 23 brand-packaging combinations considered, the pass-through coefficients vary between 2.39 and 10.05 (median = 5.30). The majority of the price change in response to a tax change occurs immediately, and prices have fully adjusted two months after the excise tax increase becomes effective. Pass-through differs substantially across packaging types. The pass-through coefficient on 750ml bottles is substantially lower than that of 330 ml (or 340 ml) cans and 6 x 330 ml (or 6 x 340 ml) “six-packs”. The overshifting of the excise tax has positive implications for public health policy, since they increase the effectiveness of alcohol taxes as a tool to reduce the (excessive) consumption of beer.

[1] Postgraduate student and professor, respectively, in the School of Economics, University of Cape Town. We thank Nicole Vellios and Evan Blecher and participants at the Postgraduate Conference for the three Western Cape universities for helpful comments and suggestions. We especially want to thank Sharon de Bruyns for excellent technical help in cleaning the data. We also thank Anita Voges and Marietjie Bennett from Statistics SA for making the data available. All errors and omissions are ours.

1. Introduction

Most introductory economics textbooks discuss the incidence of a tax imposed on a product as an application of demand and supply analysis (Mohr and Associates, 2015; Frank and Bernanke, 2013). If the tax is paid by the producer (as is typically the case), the imposition of the tax causes the supply curve to shift vertically upward by the amount of the tax. At the new equilibrium, the price is higher and the quantity is lower than at the original equilibrium. Typically the price increases by less than the amount of the tax, because a part of the tax increase is borne by the producer. The degree to which the tax is passed on to the consumer is determined by the slopes (and thus the price elasticities) of the supply and demand curves. In this paradigm it is not possible for the price to increase by more than the increase in the tax, and in most instances the retail price increases by less than the increase in the tax.

This theory describes a perfectly competitive market, an assumption often overlooked in the exposition of the analysis. In many industries, including the alcohol industry in South Africa, the assumption of perfect competition does not hold. The South African alcohol industry, like the alcohol industries of many other countries, is in fact highly concentrated. In the beer industry, firms like South African Breweries (a subsidiary of SABMiller Plc), Brandhouse Beverages (selling Heineken brands under licence in South Africa) and Namibia Breweries Ltd. have significant market power.

South African Breweries (SAB) is the market leader with a total market share of nearly 80% of the total beer market (including sorghum beer), and nearly 90% of the total beer market excluding sorghum beer. The dominant SAB brands are Carling Black Label (approximate 26% market share), Hansa Pilsner (21%), Castle (18%) and Castle Light (9%) (Euromonitor, 2014). Brandhouse's main brands are Amstel (3.6% market share in 2013) and Heineken (2.6% share in 2013). More than 98% of beer consumed in South Africa is produced in the Southern African Customs Union (SACU). Despite SABMiller's large international footprint, beer exports comprise less than 2% of SACU's production (Euromonitor, 2014). Whilst there is fierce competition between SABMiller and the other producers in terms of product development, licencing, advertising and marketing, there has not been a price war in the past 15 years.

In a competitive industry, like the one students implicitly encounter when they taught about the incidence of a tax, the tax will be *undershifted*, because the price increases by less than the increase in the tax. In extreme cases (specifically if the supply curve is perfectly elastic or the demand curve is perfectly inelastic) there would be *full pass-through* of the tax, i.e. the price increases by the full amount of the tax increase. *Overshifting* of the tax, i.e. a situation where the price increases by more than the increase in the excise tax, is theoretically not possible in a competitive industry. However, in an industry where firms have pricing power, overshifting of the tax is possible. Firms are able to increase the retail price by more than the increase in the tax, by virtue of the fact that they have the power and may have the incentive to do so.

Over the past 20 years the South African government has raised the real excise tax on alcohol, although they are modest in comparison to cigarettes' excise tax increase (Van Walbeek et al., 2013a). Other than raising tax revenue, the tax increases were aimed at

reducing the consumption of alcohol and the negative externalities associated with excessive alcohol use. Between 1994 and 2014 the real excise tax on beer increased from R47.53 to R68.92 per litre of pure alcohol (all values in 2014 prices). Over this period, recorded per capita beer consumption decreased from 97.3 litres to 78.0 litres per adult (age 15+) (assuming 5% alcohol content). Beer is the alcoholic beverage of choice for many South Africans; between 55% and 60% of recorded pure alcohol in South Africa is consumed as beer.

The trends of the past 20 years suggest that there is a negative relationship between the excise tax on beer and beer consumption. A recent review of alcohol taxation by the National Treasury (2014) cites a number of studies that have estimated the price elasticity of demand for alcohol in South Africa. According to a study by the Bureau for Economic Research (2010) the price elasticity for beer was estimated at -0.7. An earlier study by the National Treasury (2001) estimated the price elasticity of beer at -0.47. These price elasticity estimates for alcohol are similar to those found in many other countries (Van Walbeek *et al.*, 2013b). A recent study using South African cross-sectional data found that the price elasticity of all alcohol (i.e. not subdivided by category) was -0.52 (95% CI: -0.49; -0.54) (Chelwa *et al.*, 2013). While there are some differences between these price elasticity estimates due to differences in estimation techniques, type of data and length of time, the message is clear: beer consumption is significantly influenced by beer prices, but the price elasticity falls in the inelastic range.

This paper does not consider the relationship between the price of beer and the consumption of beer, but rather the relationship between the excise tax on beer and the retail price of beer, i.e. the pass-through of the excise tax to the retail price. The pass-through of the tax provides the crucial link between the implementation of a tax and its ability to affect consumer behaviour.

The National Treasury has followed a predictable and transparent excise tax policy with respect to alcohol for many years. In 2002 it set benchmarks for the overall tax burden for the main alcohol categories. The total tax burden (i.e. excise tax plus VAT, expressed as a percentage of the weighted average retail selling prices) for beer was set at 33%. In 2012, the total tax burden benchmark was increased to 35% (National Treasury, 2014). In order to protect its real revenue from this source, however, the National Treasury would increase the nominal excise tax by the inflation rate should the weighted average retail price of beer increase by less than the inflation rate in any particular period.

Section 2 provides an overview of the empirical tax incidence literature. Section 3 outlines the data used. Section 4 discusses the empirical methodology, while section 5 presents the regression results. Section 6 concludes.

2. Literature review

2.1 Tax pass-through across different products

The existing empirical literature on tax incidence has produced a wide range of results. Studies of sales tax incidence for different commodities generate the most varying results. For example, Poterba (1996) finds that the sales tax was fully passed through on *clothing* and *personal care products* across US cities between 1947 and 1977. In contrast, for the period 1925-1938 he finds that, for clothing, the tax was undershifted. For personal care items, he finds that the tax was overshifted in some cities and undershifted in others. Besley and Rosen (1998) estimate the effect of sales taxes for twelve typical household products and find that the tax is overshifted for five products, and fully passed through for the other seven products in the basic specification of the model. Politi and Mattos (2011) estimate the effects of tax changes on the retail prices of *foodstuffs* in Brazil between 1994 and 2008, controlling for local costs, and time and city effects, and find evidence of undershifting for seven products, full pass-through for two products and overshifting for one of the ten food products studied.

Studies that have investigated the tax pass-through in specific product categories, such as gasoline, cigarettes or alcohol, have found more consistent results. For example, studies that have investigated the impact of tax increases on the retail price of *gasoline* have found that these taxes are not overshifted to consumers in most cases (Chouinard and Perloff, 2004; Doyle and Samphantharak, 2008; Alm *et al*, 2009; Marion and Muehlegger, 2011).

The impact of tax increases on the prices of *cigarettes* has been extensively researched, generating results that support overshifting in most cases. Early US studies report overshifting of cigarette taxes (Barzel, 1976 and Harris, 1987). Subsequent studies, in line with the early studies, found that a US$ 1 increase in the state tax increases retail prices by between US$ 1.08 and US$ 1.14, (Keeler *et al*., 1996, Hanson and Sullivan, 2009, and Sullivan and Dutkowsky, 2012).

In contrast, Espinosa and Evans (2012), exploiting variation in cigarette taxes and prices within different US markets over time, find evidence of full pass-through of cigarette taxes but no evidence of overshifting. Similarly, controlling for household demographic characteristics and changes in the quality of goods purchased by households and using time and state fixed effects, Harding *et al* (2010) find that a $1 increase in US state excise taxes raises cigarette prices by $0.83 on average, indicating undershifting. In a study on twelve European Union countries Delipalla and O'Donnell (2001) find that the tax is undershifted in a group of six northern European countries and overshifted in a group of six central and southern European countries. Sullivan and Dutkowsky (2012) argue that the use of different control variables, data, focus periods and estimation techniques may contribute to the wide variability in these results.

Most studies indicate that *alcohol* taxes are overshifted. Controlling for state and time fixed effects and including lagged tax variables, Young and Bielińska-Kwapisz (2002) found that a US$ 1 increase in the per unit state and federal tax is expected to increase the retail prices by US$1.05-1.86 for beer, US$1.64-3.01 for spirits, and US$1.24-2.44 for wine, the range influenced by the specification of the regression equation. Kenkel (2005), using a tax hike in Alaska, found a mean tax pass-through rate of about 2 for beer and spirits sold off-premise

and a mean pass-through rates of between 3 and 4 for on-premise wine and on-premise spirits.

Bergman and Hansen (2009) find that the price of beer in Denmark increases by 1.35 Krone on average, in response to a 1 Krone increase in the excise tax, but that the price of beer decreases by only 0.27 Krone in response to a 1 Krone *decrease* in the excise tax on beer. Bakó and Berezvai (2013) find that the price of beer in Hungary increases, on average, by 1.65 Forint in response to a 1 Forint increase in the excise tax on beer. Both studies support the notion that tax increases are generally overshifted.

In contrast to these results, Harding *et al* (2010) find that beer tax increases in the US are undershifted. A later study by Siegel *et al* (2013) finds evidence of nearly full pass-through of US state excise taxes on spirits, with a $1 tax hike raising prices by $0.93 on average.

2.2 Pass-through and baseline prices

The price elasticity of demand determines the extent to which producers can shift tax increases onto consumers. To the extent that the price elasticity differs by price level, the pass-through of the tax could differ by price level. Since time-varying price elasticity estimates are not available for individual brands, empirically the effect of price elasticity on the degree of pass-through is estimated by regressing the change in the retail price on the baseline price (i.e. the price before the tax change) (Kenkel, 2005; Bergman and Hansen, 2009).

The empirical evidence on this subject is mixed. Kenkel (2005) finds that US stores with a higher baseline price for a given brand of *alcohol* overshift the tax by a smaller amount than stores with lower baseline prices (i.e. there is a convergence in the retail price across stores after the tax is imposed/increased). It is argued that stores with prices closer to marginal cost (i.e. a situation consistent with a perfectly competitive market) are less able to bear the burden of the tax, and are thus more likely to overshift the tax, than stores in oligopolistic markets (Carbonnier, 2007).

In contrast, Bergman and Hansen (2009) find that Danish stores with higher baseline prices for beer and soft drinks overshift the tax more when faced with a tax increase. Similarly, Ally *et al* (2014) find that excise and sales tax increases in the United Kingdom are undershifted for a variety of alcoholic beverages in the bottom 15% of the price distribution, but are overshifted for products sold above the median price.

Considering *cigarettes*, Chiou and Muehlegger (2010) find that pass-through for discount cigarettes in the US is higher than for premium cigarettes, which is attributed to the fact that the demand for discount cigarettes is more price-inelastic than the demand for premium cigarettes. On the other hand, Gilmore *et al* (2013) find that taxes on cigarettes in the United Kingdom across four price segments (premium, economy, mid and 'ultra-low price') are overshifted on average, but that ultra-low price brands exhibit the lowest levels of overshifting. Additionally, the pass-through of the tax increase on ultra-low price brands is delayed by the industry, whereas the tax increase is passed through faster, with overshifting in the period of the tax increase, for the more expensive brands

Some studies find no significant differential effects in tax pass-through across baseline brand prices. For example, Hanson and Sullivan (2009), Sullivan and Dutkowsky (2012) and

Espinosa and Evans (2012) find that premium/name brand cigarettes and discount/generic brand cigarettes in the US are subject to similar degrees of tax overshifting.

2.3 Geographical determinants of pass-through

Geographical factors may also determine the degree of tax pass-through. The proximity of retailers to lower-taxed states or countries is expected to reduce tax overshifting, since consumers have the option of a lower-cost substitute nearby. In fact, Sullivan and Dutkowsky (2012) find that this is the case for *cigarettes* in the US; prices tend to be lower in stores located near jurisdictions with lower tax rates than stores located near jurisdictions with similar or higher tax rates.

Doyle and Samphantharak (2008) find a similar result for *gasoline* prices. Following the reinstatement of gasoline sales taxes in Illinois and Indiana, they find that prices for gasoline are lower closer to state borders and higher further away from the borders.

While the issue of geography on pass-through is important in countries like the US and Canada, where individual states (or provinces) can set the level of the excise tax, it is not particularly relevant to South Africa (and many other countries), where the excise tax is set centrally and is levied at the same rate throughout the country. We thus do not control for regional differences in the excise tax in the subsequent analysis.

2.4 The Speed of Tax-Shifting

While tax shifting may not occur instantaneously, the literature suggests that tax changes are incorporated into prices relatively quickly. Besley and Rosen (1998), in their study of twelve *household products*, find that, on average, taxes are passed through to prices within three months. Young and Bielińska-Kwapisz (2002), in their study on *alcohol*, suggest an adjustment period of three months while Politi and Mattos (2011), in their study on *foodstuffs*, report an adjustment period of four months. Carbonnier (2007) finds that increases in the sales tax in France cause prices in the *housing repair* and *new car market* to fully adjust within two month after the tax changes. The entire effect of the tax change is reflected in the price of *gasoline* almost immediately (Alm *et al*, 2009; Marion and Muehlegger, 2011).

2.5 Summary

The tax incidence literature reveals substantial heterogeneity in the results, with a variety of factors determining how taxes are passed through to prices. A significant proportion of this literature focuses on the incidence of cigarette taxation, and in more recent years, alcohol taxation. These studies have focused primarily on the US and Europe. This paper evaluates the extent to which excise taxes on beer are passed through to retail prices in South Africa, and the timing of the pass-through.

3. Data

The price data are sourced from Statistics South Africa, which conducts detailed price surveys of consumer goods every month to compute the Consumer Price Index (CPI). The dataset comprises monthly tax-inclusive prices for beer, wine and spirits, sub-divided by brand and by packaging type. Since this paper considers the tax pass-through for beer, we ignore wine and spirits price data. Information regarding the geographical location of the retail outlet or the type of outlet is not available. Due to confidentiality restrictions, all brands were anonymised.

The data spans the period December 2001 – December 2014, with a gap in the data for 2006-2007. For these two years the data were unavailable, because the data collection method was restructured at Statistics South Africa. Despite the missing two years, the dataset is substantial, containing 229 074 price observations, of which 78 125 were for beer. Within the beer category, 72 090 observations were for lager, 5 678 for dark beer, and 357 were for other subcategories, such as cider and ale (the latter category was ignored subsequently).

Beer is sold in various types of packaging, of which the most common were 330ml/340ml individual cans (n = 28 488), 750ml bottles (n = 9 156) and 6×330ml/6×340ml "six-packs" (n = 25 781). Since there is a negligible volume difference between 330ml and 340ml cans, we treat them as identical. Thus, three main packaging types are considered: 340ml cans, 750ml bottles and 6×340ml "six-packs". These three types of packaging cover more than 80% of the beer prices collected by Statistics South Africa.

The dataset contains multiple monthly observations for each unique brand-packaging combination. For example, for lager sold in 6x340ml "six-packs", 26 different observations of brand A (mean price = R28.75, sd = R2.46) while 12 different observations of brand B (mean price = R28.95, sd = R1.77) were observed in January 2008. For each brand-packaging combination, we used the mean price of that brand-packaging combination for each month, subject to two "rules".

The first rule is that all brand-packaging combinations included in the analysis are required to have at least three observations per month. If a brand-packaging combination had less than three observations in a particular month, that month would not be considered in the analysis. The second rule is that observations whose price deviated by more than three standard deviations or by more than 50% from the mean of its brand-packaging combination in a particular month were removed from the sample. It is assumed that these observations were either incorrectly recorded or so different from the bulk of the prices that they are not representative. Of the original price observations for lager and dark beer, 657 (0.84%) observations were removed under the first rule and 496 (0.64%) were removed under the second rule.

For lager, seven different brands are considered in each of the three packaging types, yielding 20 unique brand and volume combinations.[2] For dark beer, one brand is included for all three packaging types.

Each unique brand-packaging combination is assigned a brand identification number and treated as a different type of brand. For clarity, each unique brand-packaging combination is referred to as a "brand", while the "brand category" includes all packaging types for a specific brand. For example, brand A lager in 340ml cans is treated as a different "brand" to brand A lager in 750ml bottles, although they belong to the same "brand category".

Excise taxes on beer are levied as a specific tax on the quantity of pure alcohol. In order to maintain the 33% total tax burden (35% since 2012), the Minister of Finance announces the change in the nominal excise tax at the reading of the budget in February of each year. The tax change is effective immediately, but is reflected in the excise data as becoming effective in March. Beer brands with a higher alcohol content (e.g. Carling Black Label, 5.5% alcohol content) are subject to a greater absolute tax amount than beer brands with a lower alcohol content (e.g. Castle Lite, 4%). The analysis takes cognisance of these differences.

For all empirical work (other than Figure 1), prices and taxes were converted to per litre equivalent. Real (inflation-adjusted) equivalents of the nominal variables were obtained by deflating these variables by the CPI index for all goods and services (SARB code 7170A). The index base is December 2012.

4. Empirical Methodology

In order to estimate the effects of tax changes on price changes, we use a first difference transformation. This means that an observation is lost at the beginning of every sample for every brand. Additionally, since data is missing for 2006-2007, the first observation after the data gap (typically the January 2008 observation) was removed from the analysis.

Given the panel nature of the data, ideally a fixed effects regression should be used to control for unobserved heterogeneity between brands. This method would be appropriate given that there may be time-varying and time-invariant factors effecting prices and tax pass-through that differ across brands, such as the level of market competition, strategic price behaviour or consumer perceptions.

However, the nature of the tax data does not allow for a fixed effects model. Excise taxes on beer are set at a national level, so that all beer brands are subject to the same tax by percentage of absolute alcohol. The tax changes occur in March every year. As a result there is insufficient variation in the tax variable across different brands.

The insufficient "between-group" variation makes it impossible to use fixed effects to control for unobserved heterogeneity between brands (Wooldridge, 2013). The empirical tax incidence studies in the literature that use fixed effects models are, for the most part, conducted in the US, where differences in the level of taxes and the timing of tax changes

[2] Lager brand C is the only brand for which 750ml packaging is not considered. This is because there was not enough data available for this brand for this type of packaging.

between states allow the use of panel techniques (Besley and Rosen, 1998; Young and Bielińska-Kwapisz, 2002; Sullivan and Dutkowsky, 2012). This facilitates the use of a fixed effects model to control for unobserved heterogeneity across states, instead of brands. Because the South African situation does not allow a panel approach, this paper proceeds with OLS regressions.

To consider the general trends in tax pass-through for beer, we created a pooled model as follows:

$$\Delta P_{it} = \propto + \beta_0 \Delta T_{i(t+2)} + \beta_1 \Delta T_{i(t+1)} + \beta_2 \Delta T_{it} + \beta_3 \Delta T_{i(t-1)} + \beta_4 \Delta T_{i(t-2)} + u_{it} \quad (1)$$

where ΔP_{it} represents the (month-on-month) absolute difference in real prices in month t (t = 1, 2,…T) for brand i (i = 1, 2,…N) and ΔT_{it} represents the absolute difference in the real excise tax in month t for brand i. Since manufacturers and/or retailers may pre-emptively increase the price in expectation of the tax increase, we include $\Delta T_{i(t+1)}$ and $\Delta T_{i(t+2)}$ in the regression equation. Similarly, to account for the fact that the price increase may be delayed, we also include $\Delta T_{i(t-1)}$ and $\Delta T_{i(t-2)}$ in the regression equation.

The contemporaneous tax-shifting parameter, β_2, represents the immediate change in price in as a result of the change in tax. β_2 is expected to be positive, since an increase in tax is expected to increase prices. Full tax pass-through, implies a value of β_2 of 1.14. The reason it is 1.14 and not 1.00, is because the increase in the excise tax is subject to Value-added Tax, which is levied at 14%. Had we excluded the VAT from the retail price, as is often done in other studies, $\beta_2 = 1$ is consistent with full tax pass-through. A coefficient greater than 1.14 indicates that the (VAT-inclusive) retail price rises by more than the tax increase, indicating overshifting. Conversely, a coefficient less than 1.14 indicates that the retail price rises by less than the tax increase, suggesting undershifting.

The pre-emptive tax-shifting parameters, β_0 and β_1, represent the change in the retail price two months and one month before the tax increase, respectively. A positive β_0 and/or β_1 value suggests that producers and/or retailers raise alcohol prices in anticipation of the change in tax. The delayed tax-shifting parameters are β_3 and β_4 where β_3 represents the change in the retail price in the month following the tax change and β_4 represents the change in the retail price two months after the tax change. Positive β_3 and β_4 values suggest that the producers delay the alcohol price increase in response to the initial tax increase. The sum of the five β coefficients is the long-run coefficient. The long-run coefficient indicates by how much the real retail price of beer increases in response to a R1 increase in the real excise tax, accounting for price adjustments in periods other than that of the tax change.

The constant $\propto$ describes the underlying real price trend, ignoring the impact of the excise tax increases. If $\propto$ is zero, there is no upward or downward trend in the real price of beer (again ignoring the impact of the excise tax changes), and the nominal price of beer is increasing at the overall inflation rate. If $\propto$ is positive (say 0.03), the real price of beer is increasing over time (in this example, by R0.03 per litre per month on average, expressed in constant 2012 prices), independent of the tax changes. The nominal price of beer would increase at a higher percentage than the inflation rate. A similar but opposite interpretation applies if $\propto$ is negative.

The pass-through analysis is extended by conducting an analysis of pass-through for individual brands. For each of the 23 beer brands (20 lager and three dark beer) the following regression equation is estimated:

$$\Delta P_t = \propto + \beta_0 \Delta T_{t+2} + \beta_1 \Delta T_{t+1} + \beta_2 \Delta T_t + \beta_3 \Delta T_{t-1} + \beta_4 \Delta T_{t-2} + u_t \quad (2)$$

where ΔP_t and ΔT_t represent the month-on-month differences in real retail prices and real excise tax in period t, respectively, for a particular brand. The usual leading and lagged tax variables are included to allow for a dynamic analysis.

All regression equations are estimated by means of OLS. All standard errors are corrected for heteroskedasticity and all estimates use robust (Huber) standard errors.

A methodological consideration concerns the impact of real cost changes on the level of tax shifting observed. In the presence of real cost shocks (i.e. a cost increase in excess of the inflation rate), perceived tax overshifting may be explained by higher production costs. Firms subject to cost shocks may decide to delay the price increase until the excise tax increase is announced, at which time the firm then passes both the cost and tax increase onto the consumer. If this is the case, the tax pass-through coefficient would be biased upward. Some studies in this literature, predominantly those funded by or done by the cigarette industry, explicitly include a production cost variable in their models to control for cost changes over time. This production cost variable usually includes wage, energy and rental costs (Keeler *et al*, 1996, Besley and Rosen, 1998, Delipalla and O'Donnell, 2001, Viren, 2009, Sullivan and Dutkowsky, 2012 and Bakó and Berezvai, 2013). Other studies estimate fixed effects models to control for the unobserved factors (such as costs) that do not change over time (Young and Bielińska-Kwapisz, 2002; Harding *et al*, 2010; Chiou and Muehlegger, 2010; Marion and Muehlegger, 2011; Politi and Mattos, 2011; Siegel *et al*, 2013).

The approach followed in this paper assumes that there were no real cost shocks other than the tax hikes over the observed period. Studies of alcohol tax incidence by Kenkel (2005) and Bergman and Hanson (2009), and some studies on the incidence of retail and gasoline taxes (Poterba, 1996; Gilmore *et al*, 2013; Xu *et al*, 2014), also do not include controls for cost changes.

Note that nominal cost increases in line with the inflation rate would *not* bias the coefficients. Only cost increases in excess of the inflation rate would result in an upward bias of the pass-through coefficients. Similarly, cost changes less than the inflation rate would result in a downward bias of the pass-through coefficients.

5. Results

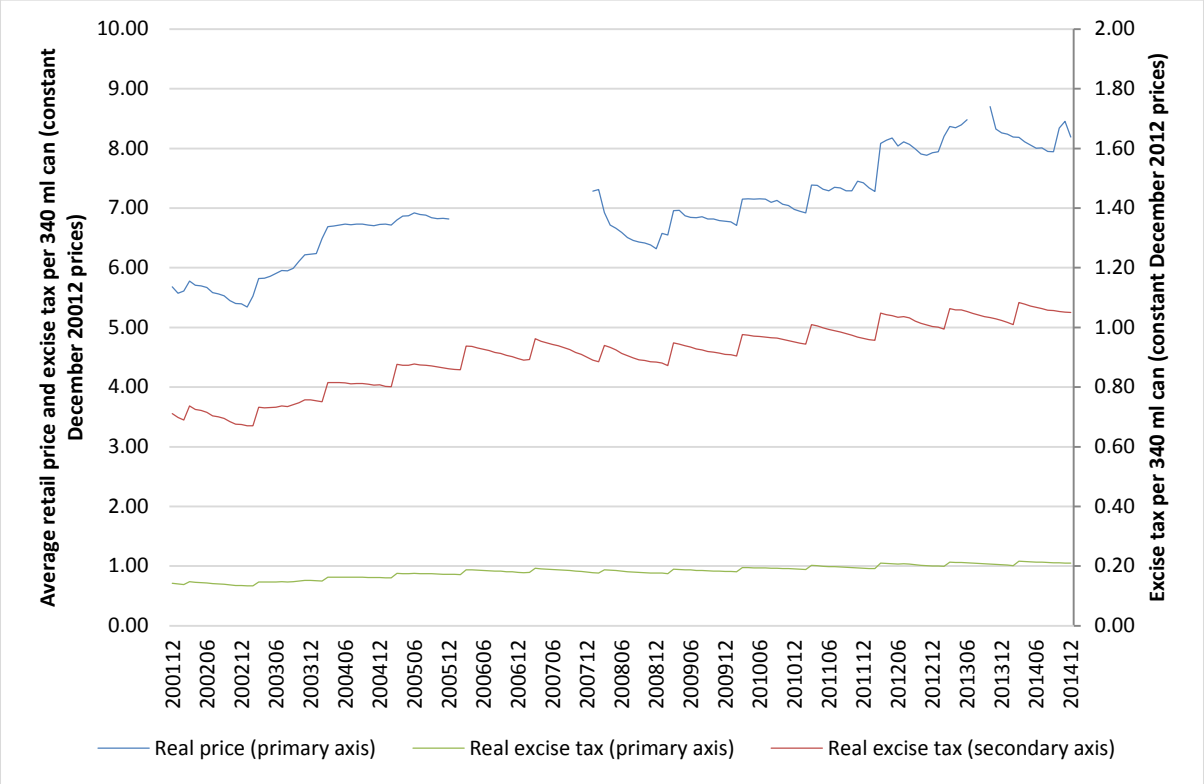
As a graphical example of the analysis that follows below, Figure 1 shows the relationship between the real retail price and the associated real excise tax of brand A lager, packaged in 340ml cans. For each month, the real retail price for this brand-packaging combination is the mean of a number of individual price observations, as collected by Statistics South Africa (range: 9; 97). The real excise tax takes cognizance of the alcohol content of this brand of beer (5%).

The excise tax is presented on both the primary and the secondary Y-axes. It is shown on the primary Y-axis to illustrate the relative share of the excise tax in retail price of this brand of beer. It is again shown on the secondary Y-axis to better illustrate the eroding effects of inflation during the course of a year and to show how the timing of the excise tax increases correspond to the timing of the retail price increases. The scale of the secondary Y-axis magnifies the excise tax five-fold, relative to the primary Y-axis.

As a percentage of the retail price the excise tax on this brand of beer (and this packaging) varies between 12% and 14% of the retail price, and between 25% and 27% if one includes the VAT amount as well. This is substantially lower than the 33% (35% after 2012) total tax burden target, and suggests that the average retail price of this brand and packaging is substantially higher than the average retail price of beer from which the National Treasury sets the excise tax. Over the 13 year period the real excise tax has increased slightly. The jagged-tooth nature of the real excise tax series reflects the fact that the nominal (and real) excise tax increases once a year (in March), but that the real excise tax is eroded by inflation in the subsequent eleven months. A similar jagged-tooth pattern exists for the real retail price series (especially after 2008), although it is not as predictable as that of the excise tax.

The increase in the real retail price is typically larger than the increase in the real excise tax, which suggests overshifting. There is a clear upward trend in the real retail price of this brand of beer. In fact, the real retail price is December 2014 was 44% (or R2.52 per can) higher than in December 2001. Even though the real excise tax has increased by 48% over the same period, the absolute increase in the real excise tax is only R0.34 per can.

Figure 1: **Real retail price per litre and real excise tax per 340 ml can of beer (Brand A)**



In Table 1 we present the results of a pooled regression, based on equation (1), for lager, dark beer and for the two beer categories combined. The analysis for lager is based on 1 453 observations, which is comprised of 131 months (Jan 2002-Dec 2005 and Feb 2008-Dec 2014), 20 brand categories and three packaging types (where there were insufficient or no price data for certain months or packaging types, these data were excluded from the analysis). The long-run pass-through coefficient, i.e. the total of the five β coefficients, for lager is 4.83. The 95% confidence interval for the long-run coefficient is (4.02; 5.64), which does not include 1.14. Within the data constraints discussed in the previous section, there is strong evidence that the excise tax increases on beer, on average, are overshifted. In fact, a R1 increase in the real excise tax on beer is predicted to increase the real retail price by R4.83, on average.

Considering the dynamics of the price increase, the β_2 coefficient (i.e. the contemporaneous price effect of the excise tax increase) is 3.55 (95% CI: 3.07; 4.03), which indicates that the excise tax is contemporaneously overshifted. The β_0 and β_1 coefficients consider the pre-emptive impact of the tax change on the price, two month and one month before the tax change becomes effective, respectively. β_0 is -0.15 (95% CI: -0.42; 0.13) and β_1 is 0.83 (95% CI: 0.56; 1.09); thus, the retail price increases one month before the tax increase becomes effective, but is not effected two months prior to the tax increase.

Similarly, considering the delayed impact of an excise tax increase on the retail price, the β_3 coefficient (0.53; 95% CI: 0.33; 0.73) suggests that there is a significant one-month delayed effect in the tax pass-through. However, there is no significant pass-through two months after the excise tax increase, as indicated by the insignificance of the β_4 coefficient.

Nearly three quarters (73.5%) of the pass-through occurs contemporaneously, i.e. in the same month as the increase in the tax. The price adjustment happens quite quickly, i.e. within the space of three months. The constant is 0.004 and not significantly different from zero, which indicates that there is no upward or downward trend in the real price of beer, after the impact of the excise tax increases have been accounted for.

The analysis for dark beer, although based on substantially fewer observations, is broadly similar to that of lager. Like lager, there is substantial overshifting of the excise tax (long-run coefficient = 4.55, 95% CI: 3.05; 6.05), and most of the effect of the tax increase on the price is felt contemporaneously. A minor difference is that the pre-emptive effect of the tax change on the retail price extends to two months, rather than one. We tested for a pre-emptive effect on the price three months before the tax change became effective, but the coefficient was not significant (results not shown).

Table 1: The impact of excise tax changes on the real retail price of beer

	Lager	**Dark beer**	**Lager and dark beer combined**
Constant	0.004	0.01	0.00
	(0.53)	(0.36)	(0.62)
β_0 (coefficient on ΔT_{t+2})	-0.15	0.28*	-0.07
	(-1.03)	(1.82)	(-0.61)
β_1 (coefficient on ΔT_{t+1})	0.83***	0.86**	0.83***
	(6.16)	(2.31)	(6.46)
β_2 (coefficient on ΔT_t)	3.55***	2.83***	3.42***
	(14.49)	(5.87)	(15.58)
β_3 (coefficient on ΔT_{t-1})	0.53***	0.55**	0.53***
	(5.17)	(2.59)	(5.63)
β_4 (coefficient on ΔT_{t-2})	0.07	0.02	0.06
	(0.68)	(0.18)	(0.68)
Long-run coefficient (LRC)	4.83***	4.55***	4.77***
($\beta_0 + \beta_1 + \beta_2 + \beta_3 + \beta_4$)	(11.72)	(5.99)	(12.83)
95% CI for LRC	4.02 - 5.64	3.05 - 6.05	4.04 - 5.50
Number of observations	1 453	209	1 662
R-squared	0.33	0.36	0.33
β_2 as percentage of the LRC	73.5	62.2	71.7

Significance levels: *significant at 10%; **significant at 5%; ***significant at1%

Note: All price and tax variables are in per-litre terms.
Robust t-statistics displayed in parentheses below the corresponding coefficient estimate.

5.1 Individual brand analysis of tax pass-through

We performed individual regression analyses on seven lager brand categories and one dark beer brand category, for a total of 23 brands, based on the definition of "brands" in section 3.[3] For some brands (especially for 750ml bottles), the period of analysis was truncated because of a lack of data in the period before 2008. The regression results, based on equation (2), are presented in Table 2.

For the 23 brands, the point estimates of the long-run pass-through coefficients (the sum of the five β coefficients) vary between 2.39 and 10.05. The coefficients are significantly higher than 1.14 for 17 brands, illustrated by the fact that 1.14 (the coefficient associated with full pass-through) is not included in the 95% confidence intervals for these 17 brands. These results strongly suggest that overshifting the excise tax is the norm in the beer industry. This is true for all three packaging types, although the *magnitude* of the pass-through differs by packaging type, as is discussed below.

For most brands, the majority of the impact of the tax increase on prices is felt contemporaneously. Excluding brand F lager in 750ml bottles, all the β_2 coefficients are significantly different from zero, and in many cases substantially greater than 1.14. The contemporaneous nature of the tax pass-through is illustrated further by the fact that the median β_2/LRC ratio is 0.65, which implies that, for the median brand, 65% of the total tax pass-through occurs in the month in which the tax increase becomes effective.

Only one of the 23 brands (brand D lager in 6x340ml "six-packs") has a significant β_0 coefficient, while nine brands have significant β_1 coefficients. Thus, where there are pre-emptive price increases, these occur nearly exclusively one month before the tax increase becomes effective, not longer. There are also delayed price changes in the periods after the initial tax change. Nine of the 23 brands report positive and significant β_3 coefficients, indicating delayed price increases one month after the tax change. Three of the 23 brands have positive and significant β_4 coefficients. The conclusion is that, for most brands, retail prices adjust rapidly, and are typically fully adjusted one month after the tax increase.

[3] Brand C lager is typically not sold in 750 ml bottles, and was thus not tracked by Statistics South Africa.

Table 2: The impact of excise tax changes on the real retail price of brands of beer

Brand	Constant	Beta 0 (coefficient on delta T_{t+2})	Beta 1 (coefficient on delta T_{t+1})	Beta 2 (coefficient on delta T_t)	Beta 3 (coefficient on delta T_{t-1})	Beta 4 (coefficient on delta T_{t-2})	Long-run Coefficient (LRC)	95% CI for LRC	N	Monitoring Period[a]	R^2	Pass-through[b]
340ml packaging												
Lager Brand A	0.02	0.38	0.80	4.53***	0.14	-0.03	5.82***	3.22 - 8.41	115	2001/12-2013/06, 2013/10-2014/12	0.52	Overshifting
	(0.99)	(0.85)	(1.41)	(4.55)	(0.55)	(-0.15)	(4.44)					
Lager Brand B	0.01	-0.68	1.15**	4.15***	0.18	-0.15	4.65***	2.05 - 7.24	115	2001/12-2013/06, 2013/10-2014/12	0.49	Overshifting
	(0.44)	(-0.92)	(2.57)	(4.49)	(0.68)	(-0.77)	(3.55)					
Lager Brand C	-0.01	-0.67	0.90	4.06***	1.13	0.18	5.60***	2.27 - 8.93	70	2008/01-2013/06, 2013/11-2014/12	0.47	Overshifting
	(-0.30)	(-0.97)	(1.13)	(4.62)	(1.45)	(0.55)	(3.36)					
Lager Brand D	0.00	-0.51	0.15	4.41***	1.14	0.81	6.00**	1.15 - 10.85	72	2008/01-2013/06, 2013/09-2014/12	0.27	Overshifting
	(0.02)	(-0.64)	(0.18)	(8.06)	(1.03)	(1.43)	(2.47)					
Lager Brand E	0.03	0.23	0.92	4.09***	1.04	0.09	6.38**	0.39 - 12.36	102	2001/12-2005/12, 2009/01-2013/06, 2013/11-2014/12	0.17	Full pass-through
	(0.40)	(0.32)	(1.40)	(3.16)	(1.35)	(0.18)	(2.12)					
Lager Brand F	0.01	-0.74	0.95*	1.99*	1.74**	0.75*	4.69*	-0.09 - 9.46	72	2008/01-2013/06, 2013/09-2014/12	0.16	Full pass-through
	(0.17)	(-0.73)	(1.72)	(1.70)	(2.52)	(1.79)	(1.96)					
Lager Brand G	0.03	0.77	2.04***	6.16***	0.09	0.99	10.05***	5.06 - 15.05	58	2009/01-2013/06, 2013/11-2014/12	0.47	Overshifting
	(0.53)	(1.42)	(3.08)	(3.67)	(0.23)	(1.25)	(4.04)					
Dark Beer Brand H	0.03	0.24	1.34**	2.89***	0.39	0.11	4.97***	2.90 - 7.03	102	2001/12-2005/12, 2009/01-2013/06, 2013/11-2014/12	0.39	Overshifting
	(1.09)	(1.10)	(2.00)	(4.29)	(1.51)	(0.55)	(4.77)					
750ml packaging												
Lager Brand A	-0.02	-0.12	0.72**	2.80***	0.18	0.07	3.65***	1.98 - 5.31	61	2008-2013/06, 2013/11-2014/02	0.62	Overshifting
	(-1.20)	(-0.84)	(2.31)	(6.81)	(0.38)	(0.41)	(4.39)					
Lager Brand B	-0.01	0.03	0.46**	1.98***	0.48***	-0.01	2.95***	1.94 - 3.95	70	2008/01-2013/06, 2013/11-2014/12	0.67	Overshifting
	(-0.44)	(0.26)	(2.35)	(6.24)	(3.40)	(-0.07)	(5.84)					
Lager Brand D	-0.01	1.13	-0.01	1.95**	1.89	0.41	5.38**	1.08 - 9.67	60	2008/01-2013/05	0.19	Full pass-through
	(-0.27)	(1.35)	(-0.04)	(2.50)	(1.54)	(0.81)	(2.51)					
Lager Brand E	-0.02	0.03	0.69	2.43***	0.69**	-0.09	3.75***	1.80 - 5.69	65	2008/05-2013/06, 2013/12-2014/12	0.53	Overshifting
	(-1.15)	(0.13)	(1.61)	(3.78)	(2.05)	(-0.62)	(3.85)					
Lager Brand F	-0.03	-0.27	-0.15	0.37	0.68	1.75**	2.39	-2.60 - 7.38	45	2009/01-2013/02	0.11	Full pass-through
	(-0.43)	(-0.21)	(-0.22)	(0.38)	(1.20)	(2.10)	(0.97)					
Lager Brand G	0.01	-0.14	0.85	3.54***	0.12	-0.92***	3.46**	0.45 - 6.46	32	2009-2012/01	0.57	Full pass-through
	(0.40)	(-0.52)	(1.13)	(5.19)	(0.27)	(-2.87)	(2.37)					
Dark Beer Brand H	-0.04	0.45	0.15	1.46**	1.09*	-0.03	3.13*	-0.12 - 6.38	49	2009/01-2013/06	0.17	Full pass-through
	(-0.67)	(1.07)	(0.38)	(2.63)	(1.82)	(-0.08)	(1.94)					

6×340ml packaging												
Lager Brand A	0.01	-0.10	0.78**	3.88***	0.76***	0.07	5.39***	3.37 - 7.42	108	2001/12-2002/09, 2002/12-2013/06, 2013/10-2014/12	0.49	Overshifting
	(0.35)	(-0.46)	(2.13)	(4.84)	(2.94)	(0.37)	(5.28)					
Lager Brand B	0.00	0.08	0.79	3.62***	0.11	0.51	5.12***	2.07 - 8.17	71	2008/01-2013/06, 2013/10-2014/12	0.40	Overshifting
	(0.05)	(0.44)	(1.54)	(3.34)	(0.33)	(1.03)	(3.35)					
Lager Brand C	-0.02	-0.10	0.98	4.35***	0.32***	-0.08*	5.46***	2.97 - 7.95	72	2008/01-2013/06, 2013/09-2014/12	0.50	Overshifting
	(-0.44)	(-0.18)	(1.49)	(4.83)	(5.02)	(-1.76)	(4.37)					
Lager Brand D	-0.03	0.86***	1.40	4.75***	0.89*	0.19	8.09***	4.75 - 11.43	65	2008/01-2013/06, 2013/09-2014/05	0.58	Overshifting
	(-1.17)	(3.83)	(1.46)	(4.55)	(1.67)	(0.81)	(4.85)					
Lager Brand E	-0.01	0.10	1.28**	4.20***	0.66**	0.34	6.57***	3.67 - 9.48	70	2008/01-2013/06, 2013/11-2014/12	0.54	Overshifting
	(-0.35)	(0.44)	(2.38)	(3.73)	(2.12)	(1.35)	(4.52)					
Lager Brand F	-0.02	-0.81	0.72	3.40***	1.52*	0.48*	5.30***	1.78 - 8.82	72	2008/01-2013/06, 2013/09-2014/12	0.37	Overshifting
	(-0.41)	(-1.32)	(0.97)	(4.67)	(1.97)	(1.68)	(3.01)					
Lager Brand G	0.02	0.13	1.80**	3.73**	0.53	-0.44	5.74***	1.81 - 9.67	58	2009-2013/06, 2013/11-2014/12	0.37	Overshifting
	(0.60)	(0.29)	(2.25)	(2.64)	(1.40)	(-1.02)	(2.93)					
Dark Beer Brand H	0.00	0.16	0.72	3.82***	0.36	-0.09	4.96***	2.55 - 7.37	58	2009/01-2013/06, 2013/11-2014/12	0.62	Overshifting
	(0.13)	(1.30)	(1.33)	(4.02)	(1.52)	(-0.56)	(4.13)					

Significance levels: *significant at 10%; **significant at 5%; ***significant at1%

Note: All price and tax variables are in per-litre terms.

Robust t-statistics displayed in parentheses below the corresponding coefficient estimate.

[a]Monitoring Period excludes 2006-2007 for all brands as no data was available for this period.

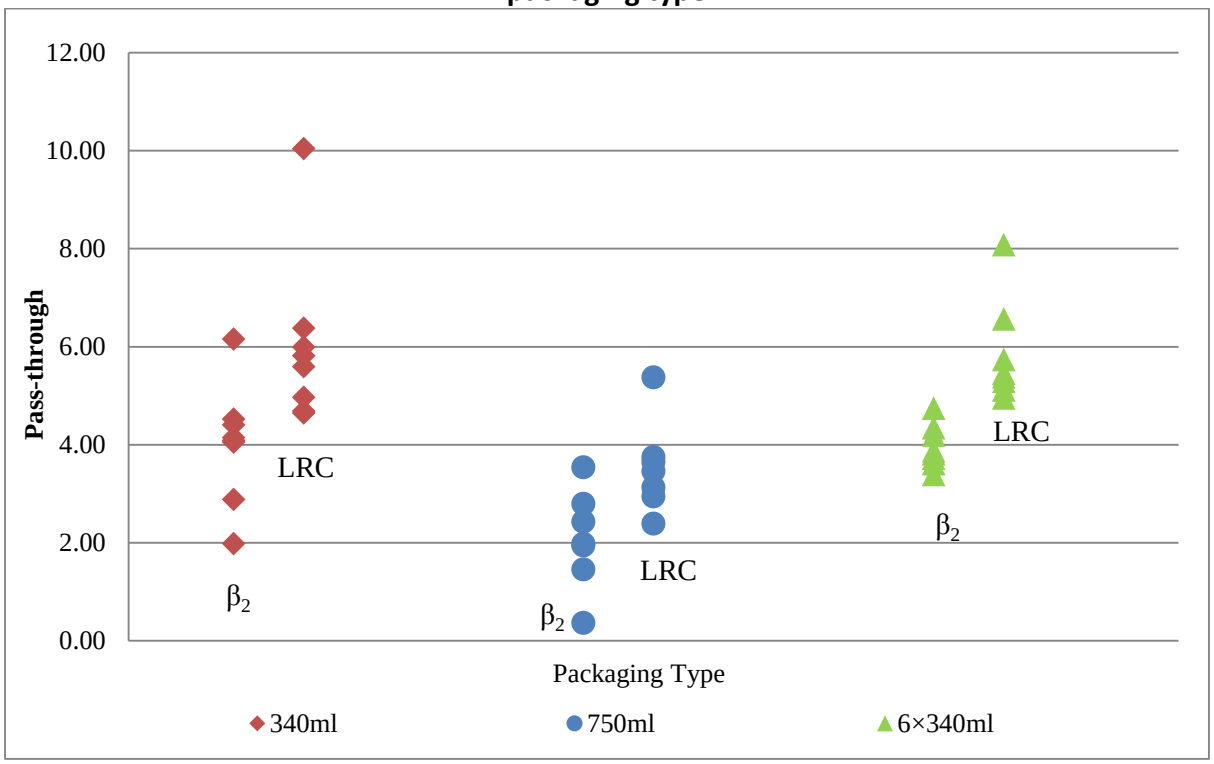
[b]Classification of pass-through according to whether the confidence intervalassociated with the long-run multiplier includes 1.14.

5.2 Packaging type and tax pass-through

Both the contemporaneous and the long-run pass-through coefficients presented in Table 2 seem to be lower for 750ml bottles than for the other packaging types. Figure 2 plots the contemporaneous (β_2) and long-run (LRC) pass-through coefficients for the seven brand categories of lager (six in the case of 750ml bottles) and one brand category of dark beer, by packaging type.

A statistical test of equivalence of means indicates that the mean of the contemporaneous pass-through coefficients (i.e. the β_2 coefficients) for 340ml cans (mean = 4.04) does not vary significantly from the seven β_2 coefficients for 6x340ml "six-packs" (mean = 3.97, p=0.89), but are significantly higher than the pass-through coefficients of 750ml bottles (mean = 2.08, p=0.005). The differences in the means of the long-run coefficients are even larger in absolute terms. The mean of the long-run coefficients for 340ml cans (6.02) is not significantly different from the mean long-run coefficient of 6x340ml "six-packs" (5.83, p=0.79), but significantly higher than that of 750ml bottles (3.53, p=0.005).[4]

Figure 2: **Contemporaneous (β_2) and long-run (LRC) tax pass-through estimates of beer, by packaging type**

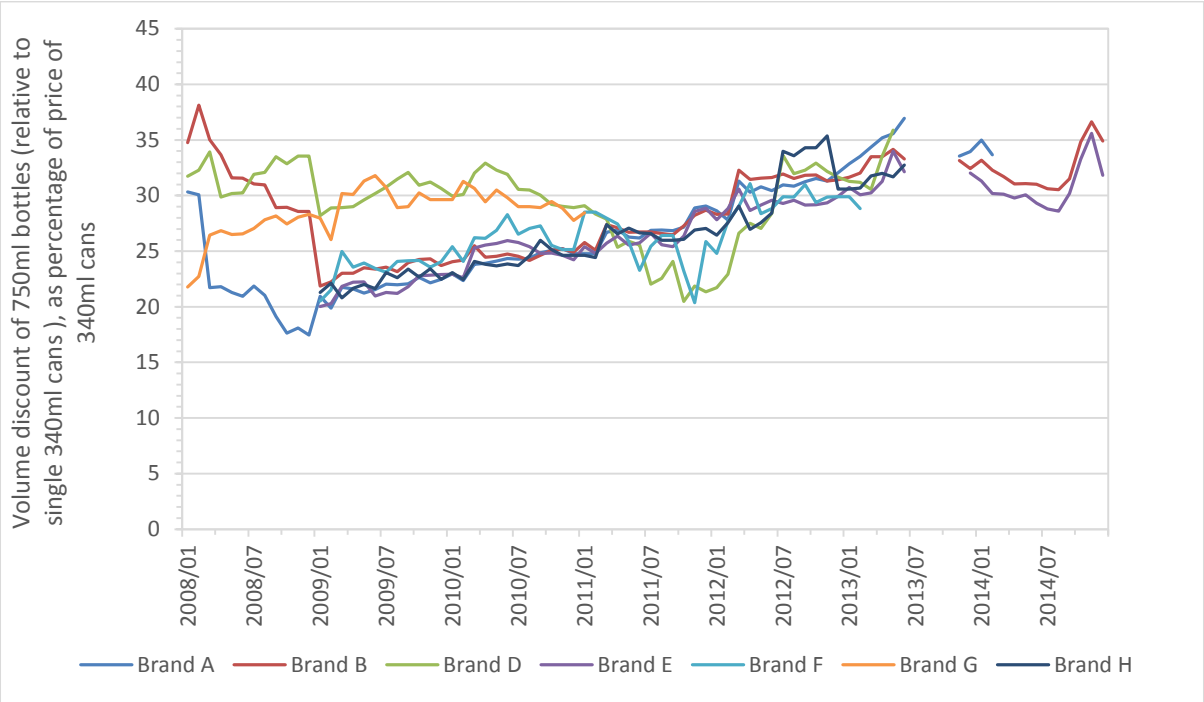


The significantly lower pass-through coefficients for 750ml bottles mean that beer sold in this packaging has become relatively cheaper than beer sold in single 340ml cans or in

[4] It could be argued that the pass-through coefficients for the various packaging types are not comparable, because they are based on different time periods. In particular, the pass-through coefficients of 340 ml cans are based on longer time series data, while those of 750 ml bottles are based on shorter time series (typically 2008-2014). We ran the analysis for the three packaging types for the restricted period (2008-2014) and the results were very similar to the results presented in Figure 2.

6x340ml “six-packs”. Figure 3 shows the “volume discount” of buying beer in 750ml bottles, relative to single 340ml cans, for seven brands between 2008 and 2014. The “discount” increases from around 25% in 2009 to between 30% and 35% in 2013 and 2014. A constant growth regression (i.e. $\ln(\text{discount percentage})_t = \alpha + \beta t + u_t$) indicates that the slopes are significant for all seven brands.

Figure 3: Discount of beer sold in 750ml bottles compared to 340ml cans



At least two possible reasons can explain this pricing behaviour. The first is that the cost of producing beer in 750ml bottles, relative to the cost of producing it in 340ml cans, has decreased and that the beer manufacturers are passing these savings through to consumers. The second explanation has to do with beer manufacturers’ strategic marketing behaviour. A firm wanting to increase its revenue and profits would increase the relatively price inelastic product by more than the relatively more price elastic product. Poorer, African consumers typically buy beer in 750ml bottles, while more affluent consumers typically buy beer in cans. Given the profile of consumers, beer in 750ml bottles is probably more price elastic than beer sold in 340ml cans. The rational response by beer manufacturers would be to raise the price of 340ml cans (and 6x340ml “six-packs”) by a greater percentage than the price of 750ml bottles.

Associated with this pricing strategy, was a marketing strategy that promoted the sale of 750ml bottles at the expense of other packaging types. For example, in 2010 Carling Black Label ran an advertisement with the tagline “Groot man of laaitie? Vra vir die volle 750ml” (“Adult man or child? Ask for the full 750ml”). The advertisement was withdrawn after civil society groups complained that it encouraged excessive drinking (https://minilicious.wordpress.com/2010/06/03/why-south-african-breweries-pulled-out-the-grootman-of-laaitie-advert/). It is likely that a combination of strong marketing and relatively lower prices would have nudged at least some people to buy beer in 750ml bottles.

6. Conclusion

In this paper we use price data collected by Statistics South Africa to assess how changes in the excise tax affect the retail price of beer in South Africa. Other than collecting revenues, excise taxes on alcohol are levied to reduce alcohol use. This crucially assumes that excise tax increases will be passed through to consumers in the form of higher retail prices. The paper investigated the pass-through of the excise tax to the retail price of beer.

We acknowledge that the specification of the regression equations is parsimonious and could be under-specified. In particular, the pass-through coefficients could be biased since we are unable to control for cost changes. To the extent that nominal production costs increased by more than the inflation rate, and that these cost changes were passed through at the same time as the increase in the excise tax, the pass-through coefficients will be biased upwards. However, should nominal costs increase by less than the inflation rate, the pass-through coefficients will be biased downwards. Despite the data limitations, we believe that this analysis is a useful starting point in understanding the effectiveness of beer excise taxes in reducing beer consumption in South Africa.

We find strong evidence that excise tax increases on beer are overshifted to consumers. The estimated pass-through coefficient for lager is 4.83 (95% CI: 4.02; 5.64) and the estimated pass-through coefficient for all beer (including dark beer) is 4.77 (95% CI: 4.04; 5.50), which means that a R1 increase in the real excise tax increases the real price by about R4.80, on average. About 65% of the price increase happens in the month when the tax increase becomes effective, although there are some pre-emptive and lagged price effects as well. The price adjustment is relatively quick, with the full effect of the tax increase being reflected in the retail prices in three months.

An analysis by brand and packaging combinations indicates that overshifting of the excise tax is the norm in the beer market. However, the pass-through coefficients for beer sold in 750ml bottles is substantially lower (although still consistent with overshifting) than the pass-through coefficients of beer sold in individual 340ml cans or 6x340ml “six-packs”.

From a public health perspective the results are generally encouraging. An increase in the excise tax has an amplified impact on the retail price of beer. By increasing the retail price by more than the increase in the excise tax, the beer industry serves its own cause (through increased profits) and that of public health (by decreasing beer consumption).

A concern, however, is the fact that the pricing strategy of the past seven years has favoured the sales of 750ml bottles at the expense of smaller containers. To the extent that this may encourage excessive drinking, this is disconcerting.

Reference List

ALLY, A.K., MENG, Y., CHAKRABORTY, R., DOBSON, P.W., SEATON, J.S., HOLMES, J., ANGUS, K., GUO, Y., HILL-MCMANUS, D., BRENNAN, A. and MEIER, P.S. (2014). Alcohol tax pass-through across the product and price range: do retailers treat cheap alcohol differently? Addiction, 109, 1994-2002.

ALM, J., SENNOGA, E. and SKIDMORE, M. (2009). Perfect competition, urbanization and tax incidence in the retail gasoline market. Economic Inquiry, 47, 118-134.

BAKÓ, B. and BEREZVAI, Z. (2013). Excise Tax Overshifting in the Hungarian Beer Market. Available at http://unipub.lib.uni-corvinus.hu/1263/1/tax_overflow.pdf

BARZEL, Y. (1976). An alternative approach to the analysis of taxation. The Journal of Political Economy, 84, 1177-1197.

BERGMAN, U.M. and HANSEN, N.L. (2009). Excise Tax Pass-Through on Beverage Prices.

BESLEY, T.J. and ROSEN, H.S. (1998). Sales Taxes and Prices: An Empirical Analysis. Working Paper No. 6667. National Bureau of Economic Research.

BUREAU FOR ECONOMIC RESEARCH (2010). *Price and Income Elasticities of the Demand for Liquor in South Africa*. Report prepared for SAB Ltd. Cited by National Treasury, 2014.

CARBONNIER, C. (2007). Who pays sales taxes? Evidence from French VAT reforms, 1987-1999. Journal of Public Economics, 91, 1219-1229.

CHELWA, G., VAN WALBEEK, C. and NYOKANGI, E. (2013). The demand for alcohol in South Africa. Chapter 8 in Van Walbeek, C. and Blecher, E. (editors): The Economics of Alcohol Use, Misuse and Policy in South Africa. Available at http://tobaccoecon.org/wp-content/uploads/2014/03/the-economics-of-alcohol-policy-in-south-africa.pdf.

CHIOU, L. and MUEHLEGGER, E.J. (2010). Consumer Response to Cigarette Excise Tax Changes. Available at http://ssrn.com/abstract=1693263.

CHOUINARD, H. and PERLOFF, J.M. (2004). Incidence of federal and state gasoline taxes. Economics Letters, 83, 55-60.

DELIPALLA, S. and O'DONNELL, O. (2001). Estimating tax incidence, market power and market conduct: The European cigarette industry. International Journal of Industrial Organization, 19, 885-908.

DOYLE, J. J. and SAMPHANTHARAK, K. (2008). $2.00 Gas! Studying the effects of a gas tax moratorium. Journal of Public Economics, 92, 869-884.

ESPINOSA, J. and EVANS, W. N. (2012). Excise Taxes, Tax Incidence and the Flight to Quality: Evidence from Scanner Data. Public Finance Review,1-30.

EUROMONITOR INTERNATIONAL (2014). Passport: Beer in South Africa. (Report published in September 2014)

FRANK, R. H. and BERNANKE, B. S. (2013). Principles of Economics (5th edition). McGraw-Hill.

GILMORE, A.B., TAVAKOLY, B., TAYLOR, G. and REED, H. (2013). Understanding tobacco industry pricing strategy and whether it undermines tobacco tax policy: the example of the UK cigarette market. Addiction, 108, 1317-1326.

HANSON, A. and SULLIVAN, R. (2009). The Incidence of Tobacco Taxation: Evidence from Geographic Micro-Level Data. National Tax Journal, 62 677-695.

HARDING, M., LEIBTAG, E. and LOVENHEIM, M. (2010). The heterogeneous geographic and socioeconomic incidence of cigarette and beer taxes: evidence from Nielsen Homescan data.

HARRIS, J.E. (1987). The 1983 increase in the federal cigarette excise tax. Tax Policy and the Economy, 1, 87-112.

KEELER, T.E., HU, T., BARNETT, P.G., MANNING, W.G. and SUNG, H.(1996). Do Cigarette producers Price-discriminate by State? An Empirical Analysis of Local Cigarette Pricing and Taxation. Journal of Health Economics, 15, 499-512.

KENKEL, D.S. (2005). Are Alcohol Tax Hikes Fully Passed Through to Prices? Evidence from Alaska. The American Economic Review, 95, 273-277.

MARION, J. and MUEHLEGGER, E. (2011). Fuel tax incidence and supply conditions. Journal of Public Economics, 95, 1201-1212.

MOHR, P.J. and Associates. (2015). Economics for South African students, 5th edition. Van Schaik.

NATIONAL TREASURY. (2001). *The Taxation of Alcoholic Beverages in South Africa (and its impact on the consumption levels of alcoholic beverages)*.A discussion document by the Tax Policy Chief Directorate of the South African National Treasury. November 2001.

NATIONAL TREASURY. (2014). A Review of the Taxation of Alcoholic Beverages in South Africa: A Discussion Document. Available at http://www.treasury.gov.za/public%20comments/Alc/Alcohol%20Tax%20Review%20-%20May%202014%20Discussion%20Paper.pdf.

POLITI, R.B. and MATTOS, E. (2011). Ad-valorem tax incidence and after-tax price adjustments: evidence from Brazilian basic basket food. Canadian Journal of Economics, 44, 1438-1470.

POTERBA, J. M. (1996). Retail Price Reactions to Changes in State and Local Sales Taxes. National Tax Journal, 49, 165-176.

SIEGEL, M., GRUNDMAN, J., DEJONG, W., NAIMI, T.S., KING III, C., ALBERS, A.B. and JERNIGAN, D.H. (2013). State-Specific Liquor Excise Taxes and Retail Prices in 8 US States, 2012. Substance Abuse, 34, 415-421.

SULLIVAN, R.S. and DUTKOWSKY, D.H. (2012). The Effect of Cigarette Taxation on Prices: An Empirical Analysis Using Local-Level Data. Public Finance Review, 40, 687-711.

VAN WALBEEK, C.P., CLEOPHAS, E. and MANINIE (2013a). Trends in alcohol consumption, excise tax, and excise tax revenue in South Africa. Chapter 3 in Van Walbeek, C. and Blecher, E. (editors): The Economics of Alcohol Misuse, Abuse and Policy in South Africa: Chapter 4. Unpublished report for WHO.

VAN WALBEEK, C., ROONEY, C. and OBADEYI, O. (2013b). Literature review on estimating price and income elasticities for alcohol. Chapter 7 in Van Walbeek, C. and Blecher, E. (editors), The Economics of Alcohol Misuse, Abuse and Policy in South Africa: Chapter 4. Unpublished report for WHO.

VIREN, M. (2009). Does the Value-Added Tax Shift to Consumption Prices?.Czech Economic Review, 123-142.

WOOLDRIDGE, J. (2013). Introductory Econometrics: A Modern Approach, Fifth International Edition. Canada: South-Western Cengage Learning. 466-474.

XU, X., MALARCHER, A. and KRUGER, J. (2014). Does Every US Smoker Bear the Same Cigarette Tax?. Addiction,109, 1741-1749.

YOUNG, D.J. and BIELIŃSKA-KWAPISZ, A. (2002). Alcohol Taxes and Beverage Prices. National Tax Journal, 55, 57-73.

southern africa labour and development research unit

The Southern Africa Labour and Development Research Unit (SALDRU) conducts research directed at improving the well-being of South Africa's poor. It was established in 1975. Over the next two decades the unit's research played a central role in documenting the human costs of apartheid. Key projects from this period included the Farm Labour Conference (1976), the Economics of Health Care Conference (1978), and the Second Carnegie Enquiry into Poverty and Development in South Africa (1983-86). At the urging of the African National Congress, from 1992-1994 SALDRU and the World Bank coordinated the Project for Statistics on Living Standards and Development (PSLSD). This project provide baseline data for the implementation of post-apartheid socio-economic policies through South Africa's first non-racial national sample survey.

In the post-apartheid period, SALDRU has continued to gather data and conduct research directed at informing and assessing anti-poverty policy. In line with its historical contribution, SALDRU's researchers continue to conduct research detailing changing patterns of well-being in South Africa and assessing the impact of government policy on the poor. Current research work falls into the following research themes: post-apartheid poverty; employment and migration dynamics; family support structures in an era of rapid social change; public works and public infrastructure programmes, financial strategies of the poor; common property resources and the poor. Key survey projects include the Langeberg Integrated Family Survey (1999), the Khayelitsha/Mitchell's Plain Survey (2000), the ongoing Cape Area Panel Study (2001-) and the Financial Diaries Project.

www.saldru.uct.ac.za
Level 3, School of Economics Building, Middle Campus, University of Cape Town
Private Bag, Rondebosch 7701, Cape Town, South Africa
Tel: +27 (0)21 650 5696
Fax: +27 (0) 21 650 5797
Web: www.saldru.uct.ac.za