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Going 'Super Value' in New Zealand: cigarette pricing strategies during a period of sustained annual excise tax increases

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ABSTRACT

Background Between 2010 and 2020, the New Zealand (NZ) Government increased tobacco excise tax by inflation plus 10% each year. We reviewed market structure changes and examined whether NZ tobacco companies shifted excise tax increases to maintain the affordability of lower priced cigarette brands.

Methods We cluster-analysed market data that tobacco companies supply to the NZ Ministry of Health, created four price partitions and examined the size and share of these over time. For each partition, we analysed cigarette brand numbers and market share, calculated the volume-weighted real stick price for each year and compared this price across different price partitions. We calculated the net real retail price (price before tax) for each price partition and compared these prices before and after plain packaging took effect.

Results The number and market share of Super Value and Budget brands increased, while those of Everyday and Premium brands decreased. Differences between the price of Premium and Super Value brands increased, as did the net retail price difference for these partitions. Following plain packaging's implementation, Super Value brand numbers more than doubled; contrary to industry predictions, the price difference between these and higher priced brands did not narrow.

Conclusions Between 2010 and 2020, NZ tobacco companies introduced more Super Value cigarette brands and shifted excise tax increases to reduce the impact these had on low-priced brands. Setting a minimum retail price for cigarettes could curtail tobacco companies' ability to undermine tobacco taxation policies designed to reduce smoking.

INTRODUCTION

Marketers manipulate prices to foster brand switching, prompt trial and impulse purchase, and maintain purchase patterns¹; governments have responded by increasing tobacco excise taxes to decrease youth uptake and adult smoking prevalence.² In high-income countries, for every 10% tobacco excise tax increase fully applied to tobacco prices, consumption typically falls by 4%–5% as rising prices stimulate quit attempts and reduce smoking uptake.^{3–5}

Industry documents reveal that tobacco companies used pricing strategies to shape the behaviour of people who smoke and foster uptake among young people.⁶ They resist excise taxes by arguing these are regressive, compound disadvantage,⁷ and foster trade in illicit tobacco.⁸ Nonetheless, independent

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Tobacco companies can undermine tobacco excise tax increases designed to prompt quitting and discourage smoking uptake by disproportionately increasing the price of Premium brands (over-shifting) while minimising the price increases applied to Budget brands (under-shifting).

WHAT THIS STUDY ADDS

⇒ Between 2010 and 2020, New Zealand-based tobacco companies used differential price shifting to reduce the impact of annual tobacco excise tax increases on lower priced brands compared with higher priced brands.
⇒ Following the implementation of plain packaging, tobacco companies introduced several new Super Value brands; while the market share of these brands increased, the price difference between lower priced and higher priced brands did not narrow.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Setting a minimum retail price could prevent tobacco companies from undermining the intent and impact of tobacco excise tax increases.

analyses have found that excise tax increases may reduce health inequities; they also reveal tobacco companies' involvement in illicit trade and present strategies to reduce illicit tobacco supply.^{3,9–11}

Tobacco companies undermine excise tax increases by disproportionately passing these onto Premium brands (over-shifting) and away from Budget brands (under-shifting).¹² This strategy reduces the incentive for people on lower incomes to quit smoking in response to rising prices. A systematic review examining excise tax increases in Australia, Bangladesh, Taiwan, Spain, the USA and European Union countries found strong evidence of tax over-shifting and under-shifting.¹³ A Canadian study not included in the review found that tobacco companies responded to excise tax increases by supplying lower priced cigarettes to people who might otherwise have quit, but maintained their revenues by over-shifting the taxes to more expensive brands.¹⁴

An earlier UK study of cigarette prices between 2000 and 2009 found that the real weighted average price of Premium, mid-priced and economy



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brands increased gradually over the period concerned, while the real price of ultra-low-priced (ULP) brands barely changed.¹⁵ Between 2006, when ULP brands first appeared in the UK, and 2009, the average price of ULP brands increased by just 1.3 pence per stick compared with increases of 4.1–4.9 pence for the more expensive brands. Because taxes were under-shifted in the ULP partition and over-shifted in the other three partitions, the real price gap between these market partitions widened.¹⁵

A subsequent UK replication study using data from 2009 to 2015 produced similar results; despite regular tax increases, average real prices for the cheapest cigarette partitions remained steady from 2013, while sales volumes grew.¹⁶ Reductions in pack size and price-marking (printing the recommended retail price (RRP) on packs) maintained low prices. Although the authors noted that plain packaging would prevent both strategies, they called for further changes in tax policy to minimise tobacco companies' attempts to thwart government health policy.¹⁶

Sheikh *et al*¹³ found that, as well as differentially shifting taxes between brands, tobacco companies reduced the impact of tobacco excise increases by launching new, low-priced brands using price smoothing (ie, reduced the impact of price increases by introducing these gradually rather than as one sharp increase) and price discrimination (ie, targeted pricing to specific consumer groups), developing product promotions and changing product attributes.¹³ However, in high-income countries, tobacco companies often over-shifted excise tax increases to higher-priced products.¹⁵

We examine tobacco companies' use of these strategies in New Zealand (NZ), where from 2010 to 2020, the government applied annual excise tax increases of at least 10% to all tobacco products. The tax was a fixed amount per stick and the annual adjustment also included an inflation uplift measured by the Consumers Price Index (CPI) in the previous year; the tax was applied on 1 January each year (with the final increase applied on 1 January 2020). We also examined pricing responses to plain packaging, introduced in March 2018 (with full implementation 3 months later).

To date, few studies document how tobacco companies respond to sustained excise tax increases. A 2014 study compared the RRP of three British American Tobacco (BAT) cigarette brands (representing the Premium, mainstream and Budget price partitions) with these brands' expected retail price, calculated by applying the annual excise tax and CPI increases introduced by the NZ Government in 2010.¹⁷ This study found the median increase in price before and after the 2014 tax increase of 10% was only 3% for the Budget brand, but 8% for the Premium brand and 11% for the mainstream brand. The authors concluded that tobacco companies were undermining the excise tax policy and impeding realisation of the NZ Government's Smokefree 2025 goal.¹⁷ However, the three brands analysed may not have represented the total market. Further, the study examined prices in relation to a single tax increase and did not assess how tobacco companies use pricing to respond to policies such as plain packaging, which reduces the value proposition tobacco brand imagery represents.^{18 19}

Tobacco companies have argued that plain packaging would reduce brand differentiation and consumer choice, and lower prices across market partitions, thus likely increasing smoking prevalence.²⁰ UK studies undertaken after plain packaging was implemented in May 2017 found no evidence prices had reduced over the long term or that the price range had narrowed.^{16 21} Instead, they reported reduced under-shifting, although this change occurred alongside introduction of a minimum excise tax.^{16 21} A post-implementation study in

Australia, the first country to introduce plain packaging, found that prices displayed on price boards did not decrease post-plain packaging.²² Analyses of RRP post-plain packaging also found these were higher in real terms (ie, increased beyond inflation) and continued to rise after plain packaging.^{23 24}

Australian studies noted the growth of a Super Value market partition post-plain packaging.²⁵ A large survey of Australians who smoke reported use of value brands had increased and found that price increases post-plain packaging occurred in all market partitions, particularly the Premium partition.²⁶ More recent work found tobacco companies protected the new value partition they had created by cushioning tobacco tax increases and passing these on incrementally over several months.²⁴

Because NZ now has among the highest tobacco prices of any country, tobacco companies have a strong incentive to undermine tobacco excise taxes (the 2021 price of a pack of 20 Marlboro cigarettes was NZ\$36.90 (~US\$25)). NZ requires tobacco companies to furnish annual data on the number of cigarettes released for each brand, variant and pack size, and RRP. These data offer a unique opportunity to gain insights into how a tobacco market evolved over an extended period of excise tax increases and following implementation of plain packaging. Given the earlier NZ study¹⁷ and international findings,^{13 15 16} we hypothesised that the number of Budget brands and their market shares would increase, and that the price differential between Budget and Premium brands would also increase.

METHODS

We sourced the annual manufactured cigarette returns between 2010 and 2020 for BAT, Imperial Tobacco (IMP) and Philip Morris International (PMI) from the NZ Ministry of Health website (these companies account for 99% of the tobacco sold in NZ).²⁷ The annual returns report the price and volume of sticks released for sale for every cigarette brand imported into or manufactured in NZ. Price discounting promotions are not permitted in NZ, but some small retailers may have charged more or less than the RRP for cigarettes they sold. However, Marsh *et al* estimated that 82% of the small retailers they surveyed in 2013–2014 complied with BAT's recommended RRP¹⁷; consequently, the prices reported in the annual cigarette returns represent the retail prices paid by most NZ people who smoke. Between 2010 and 2020, manufactured cigarette sales accounted for between 64% and 73% of tobacco sales volume in NZ (sales of roll-your-own (RYO) tobacco accounted for nearly all the remainder). Because the RYO market has fewer brands, saw market share in 2020 increase by only four percentage points compared with 2010 and had a largely constant price relative to Super Value cigarettes between 2017 and 2020, we focus on manufactured cigarettes.

Creating price partitions

We created price partitions by performing cluster analysis that allocated brands to a specific partition for each year of our study. We applied the RRP for 20-stick packs, which constituted 53% of all packs sold between 2010 and 2020 (range: 44.2% in 2017 to 65% in 2020) to all pack sizes of that brand (the other main pack sizes were 25 and 30). This process standardised the price for each pack size and brand, removed the volume discount effect of bundled packs and packs with a 'free' cigarette (eg, 21 cigarettes in a notional 20-stick pack) and allowed us to include all the sales data in the price partition analysis. (Volume discounts would have reduced the unit stick price for

the brand but conceptually would not have changed the price partition of the brand; see online supplemental file 1 for further information.)

We normalised the standardised cigarette price data for each year using min-max scaling to remove the yearly price increase effect (ie, converted all prices in each year to values between 0 and 1 to remove the effect of prices increasing over time).

$$Z_{it} = \frac{x_{it} - \min(x_t)}{\max(x_t) - \min(x_t)}$$

where: z_{it} = scaled price for brand i in year t ; x_{it} = original price for brand i ; $\min(x_t)$ = the lowest price for any brand in year t ; and $\max(x_t)$ = the highest price for any brand in year t .

We cluster-analysed the entire normalised data set using the R package Ckmeans.1d.dp and performed univariate k-means clustering to estimate three price clusters for the total data set: Budget/value, Everyday and Premium.^{28 29} We then separately analysed the Budget/value cluster into two clusters: Budget and Super Value (the data for this latter analysis were re-normalised against the Budget/value data). We also estimated a four-cluster solution directly, but the goodness of fit was lower than for the two-stage clustering method described. We assessed the face validity of the clustering results and reallocated a small number of brands to correct marginal partition anomalies (see online supplemental file 1 for further details).

Price analyses

Using the RRP for each brand and pack size (ie, unstandardised prices), we conducted two price analyses. First, we divided the RRP for each brand by the pack size to calculate the unit stick price. We then divided the unit stick price by the CPI (using 2010 as the base) to remove the impact of inflation and hence produce the real unit stick price for each year (see online supplemental file 2). We multiplied the real unit stick price by the sales volume for each brand and then aggregated the results across brands to calculate the mean volume-weighted real stick price for each price partition in each year. From these prices, we calculated the absolute price difference between the mean volume-weighted real stick price for the Premium partition and the Super Value partition.

For the second price analysis, we calculated the inflation-adjusted (real price) mean net retail price for each price partition in each year by subtracting the retail sales tax (in NZ applied to all goods and services at 15%) and excise tax from the mean real RRP for all brands in a partition and adjusting the result for inflation. In 2010, two excise tax levels applied; we used the 29 April excise tax (ie, the tax that applied for most of the year). We examined changes in the net retail price to identify pricing behaviours and interpreted an increase in net retail price as over-shifting and a reduction as under-shifting.

Sales volume market shares and brand numbers

We also calculated the volume market share for each price partition in each year and recorded the number of brands and pack sizes within each partition for each year.

RESULTS

Between 2010 and 2020, BAT, IMP and PMI sold approximately 50 different brands in NZ ('brands' refers to overall brands, such as Pall Mall, rather than brand variants, such as Pall Mall Red, Pall Mall Blue and Pall Mall Green); around a quarter of these were sold in each of the years analysed. Brand numbers in the Super Value and Everyday partitions were relatively stable until 2020; Super Value brand numbers ranged from three to five, before increasing to seven in 2020. Budget brand numbers ranged from five to seven (six in 2020) and Everyday brand numbers ranged from nine to 12, before declining to six in 2020. Premium brand numbers remained at 12–13 until 2014 when they declined to eight; from 2016 to 2019 the Premium partition contained five brands, though numbers increased to eight in 2020. By 2020, Super Value brand numbers had more than doubled while Premium brand numbers had nearly halved (see online supplemental table 2). The period examined thus saw the composition of price partitions change markedly as Super Value brands proliferated and Premium brands contracted.

Table 1 shows the volume share of each market price partition over time. Between 2010 and 2020, the market shares of Super Value and Budget brands increased markedly, while those of Everyday and Premium brands decreased. The increase in Super Value and Budget brands' market share was particularly marked after plain packaging was fully implemented in June 2018. Specifically, Super Value brands' market share increased from 3.2% in 2010 to 24.4% in 2020 and Budget brands' market share increased from 16.8% in 2010 to 49.6% in 2020. Everyday brands' market share decreased from 52.6% in 2010 to 15.2% in 2020, while Premium brands' market share decreased from 27.3% in 2010 to 10.7% in 2020.

Table 2 shows changes in volume-weighted real stick prices over time. Between 2010 and 2020, the absolute difference between the price of Premium brands and Super Value brands increased from 19.7 cents per stick to 30.5 cents per stick. The differences were greater in 2018–2019, immediately following plain packaging, but reduced slightly in 2020. Between 2010 and 2019–2020, real unit stick prices increased more for Everyday (87.4 cents) and Premium (86.7 cents) brands than for Budget (77.7 cents) or Super Value (75.9 cents) brands.

Figure 1 illustrates trends in volume-weighted real stick price for each price partition in table 2 and shows that prices did not reduce following plain packaging's introduction. Real prices in all price partitions increased markedly in 2018; while these

Table 1 Price partition market share of manufactured cigarette brands in NZ: 2010–2020

Market partition	Volume market share (%) by year										
	2010	2011	2012	2013	2014	2015	2016	2017	2018*	2019	2020
Super Value	3.2	3.8	4.8	8.6	10.3	15.5	17.4	16.7	24.4	16.9	24.4
Budget/Value	16.8	18.8	17.3	13.4	13.7	21.5	25.6	32.0	40.3	50.9	49.6
Total Budget	20.0	22.6	22.1	22.0	24.0	37.0	43.0	48.7	64.7	67.8	74.0
Everyday	52.6	54.5	56.1	56.9	59.3	45.8	41.8	36.7	21.0	19.1	15.2
Premium	27.3	22.8	21.7	21.1	16.7	17.2	15.2	14.6	14.3	13.1	10.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Plain packaging fully implemented in June 2018. NZ, New Zealand.

Table 2 Volume-weighted real stick price by manufactured cigarette brand partition: 2010–2020

Market partition	Volume-weighted real stick price (cents NZ)*										
	2010	2011	2012	2013	2014	2015	2016	2017	2018†	2019	2020
Super Value	50.2	57.9	65.8	69.9	75.2	85.0	91.7	100.6	109.4	119.0	126.1
Budget/Value	54.3	60.2	67.3	73.7	80.4	92.2	101.7	104.1	122.1	130.9	132.0
Everyday	62.3	69.2	76.7	80.5	94.3	102.8	112.9	111.1	134.5	147.3	149.7
Premium	69.9	76.9	85.5	90.6	104.6	115.1	121.9	122.6	143.9	156.7	156.6
Price difference Premium–Super Value	19.7	19.0	19.7	20.7	29.4	30.1	30.2	22.0	34.5	37.7	30.5

*Prices shown are in NZ\$2010.
†Plain packaging fully implemented in June 2018.
NZ, New Zealand.

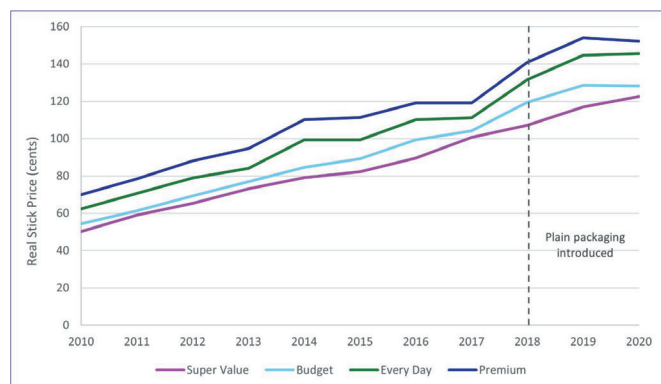
flattened off in 2020, they were at least 25% higher in 2020 than in 2017.

We next analysed net real retail prices. If the excise tax had been fully passed on to the observed retail price, the net inflation-adjusted price in each price partition would remain constant between years. However, a decrease in the net price from year to year suggests the excise taxes were under-shifted, or, conversely, over-shifted if the net price increased. [Table 3](#) highlights the net real prices that declined or increased year on year.

Our findings indicate consistent over-shifting of excise tax on brands in all price partitions for most years between 2011 and 2020 where the year-on-year change was one cent or more (we consider a change of less than one cent as effectively no change). Comparing the mean differences in net prices for each year to the net price in 2010 shows that the mean difference for Super Value brands and Budget brands was an increase of 8.0 and 9.5 cents, respectively; those for Everyday and Premium brands were 13.7 and 15.7 cents, respectively. Over-shifting for more expensive brands was nearly double that for lower priced brands, increasing the differential in price between the price partitions. [Figure 2](#) illustrates the patterns of these changes in net prices and shows that net real prices for Everyday and Premium brands increased more sharply than prices for Super Value or Budget brands over the period concerned.

In 2019, following full implementation of plain packaging, the real net price of Super Value brands decreased by 8% and fell further in 2020. Similarly, the real net price of Budget, Everyday and Premium brands declined by around 5% between 2018 and 2020, and plain packaging was associated with excise tax under-shifting in all price partitions.

As well as price shifting across brands over time, tobacco companies could potentially manipulate pack sizes within brands

**Figure 1** Average volume weighted real price by price partition: 2010–2020

to under-shift excise tax increases; we undertook a preliminary analysis of this question. Between 2010 and 2018, pack sizes ranged from 20 to 60 sticks; pack size proliferation was particularly marked in the Budget and Everyday partitions (though 20 packs were almost always the single biggest pack size category) (see online supplemental file 3). The unit stick prices for larger packs were sometimes lower than the unit stick price for a pack of 20, though not always. Where larger packs offered a ‘quantity discount’, doing so effectively meant under-shifting the excise tax on these packs because this tax is levied per stick. For example, in 2017, the price of a Horizon 20-pack was \$24.50 and the price of a Horizon 21-pack was \$25.00, a difference of 50 cents for one extra stick when the excise tax was 73.8 cents per stick and the per-stick price was 122.5 cents.

DISCUSSION

To discourage smoking uptake among youth and encourage cessation, the NZ Government raised tobacco excise taxes between 2010 and 2020, making the real price of cigarettes among the highest globally. Our analyses suggest tobacco companies undermined this policy by reducing Everyday and Premium brand numbers while proliferating Budget and Super Value brands. For example, in 2019 and 2020, tobacco companies introduced

Table 3 Net real cigarette prices for manufactured cigarettes by market partition of brand: 2010–2020

Year	Net real cigarette prices*† (NZ cents per stick)			
	Super Value	Budget	Everyday	Premium
2010	8.8	13.1	19.4	27.0
2011	12.4	14.8	22.1	30.4
2012	<i>12.6</i>	<i>15.6</i>	23.5	32.7
2013	<i>12.8</i>	17.8	<i>22.2</i>	33.1
2014	<i>13.1</i>	18.5	28.7	40.8
2015	16.4	22.1	31.7	44.7
2016	17.4	24.7	35.7	44.9
2017	19.7	27.4	39.0	50.7
2018†	22.7	28.6	42.3	48.9
2019	<u>20.9</u>	29.6	45.0	54.3
2020	<u>19.6</u>	26.9	41.2	46.1
Mean price difference compared with 2010	+8.0	+9.5	+13.7	+15.7

*Where the real price is net of goods and services tax (GST) and excise tax and deflated by the Consumers Price Index (CPI).
†Underlined numbers indicate under-shifting; bold numbers indicate over-shifting. Italic numbers indicate year-on-year differences of less than one cent.
‡Plain packaging fully implemented in June 2018.
NZ, New Zealand.

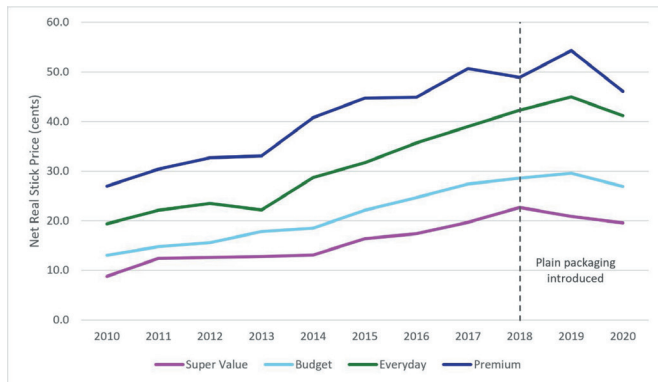


Figure 2 Net real stick price by price partition: 2010–2020

three low-priced variants of existing brands—Rothmans Royals, Rothmans London and Marlboro Crafted—and reintroduced Chesterfield. These additions more than doubled the number of Super Value brands available, giving people who smoke more lower priced brand options.

Adding new brands, particularly those with sophisticated names that did not have pre-existing low-cost connotations, potentially ameliorated negative perceptions of trading down and facilitated movement to cheaper brands. Individually, these new brands had relatively small market shares, but growth in this price partition meant the overall market share of Super Value brands increased from 3.2% to 24.4% over the study period. Even more striking was the increase in market share of Budget brands (from 16.8% in 2010 to 49.6% in 2020); overall, the market share of brands in these two partitions increased from 20.0% to 74.0%. Despite tobacco companies' predictions that plain packaging would narrow the price range between lower priced and higher priced brands,^{20 30 31} the price difference between Super Value and Premium brands widened in both 2019 and 2020.

Between 2010 and 2018, tobacco companies appear to have over-shifted the annual excise tax increases in all price partitions in most years, though over-shifting was greater for Everyday and Premium brands than for Super Value or Budget brands. Differential shifting of tax between lower priced and higher priced brands meant Super Value and Budget brands became relatively cheaper compared with Everyday and Premium brands; this differential increased over time. Furthermore, though many year-on-year changes in net real prices were small, because these were spread over hundreds of thousands of cigarette sticks, they had considerable revenue, and potentially profit, implications.

Our results suggest plain packaging may have subsequently led to under-shifting of the excise tax increases in NZ, particularly for Super Value and Budget brands. In 2019, the mean real net price of Super Value brands decreased, and in 2020 the real net price for all price partitions decreased (though actual RRP's continued to increase in all price partitions). Decreases in net real prices may indicate that excise tax had increased to a point where the industry had to change its pricing strategy to one of consistent under-shifting. Alternatively, these decreases could reflect plain packaging's effects, which reduced opportunities to use branding to support differential prices. Our findings are consistent with price-shifting practices observed in the UK and elsewhere,^{13 16} and provide additional evidence to challenge pricing arguments used to deter the introduction of plain packaging.²¹

Introducing a minimum price alongside plain packaging could reduce tobacco companies' ability to under-shift tobacco excise tax increases. For example, an American study modelling different minimum retail price scenarios concluded that minimum pricing could be very effective if it was sufficiently high; importantly, it could also promote health equity.³² Simulation studies undertaken in California predicted minimum retail prices would lead to substantial decreases in smoking prevalence and smoking intensity,^{33 34} with the greatest reduction in smoking prevalence occurring among young people and under-privileged populations.³⁴ A survey of responses to a hypothetical minimum retail price for tobacco among people who smoke in the UK provided further support for a minimum price strategy. Approximately 20% of those surveyed indicated they would smoke less or quit, and around 40% indicated that minimum retail prices would help them to stay quit.³⁵

Other product categories, such as alcohol, indicate the political feasibility and effectiveness of minimum pricing policies. In May 2018, Scotland introduced a minimum unit price for alcohol to reduce the availability of very cheap, strong alcohol; Wales followed suit in March 2020. Evaluations show subsequent increases in the average price of alcohol and reduced household purchases of alcohol in both Scotland and Wales, compared with England (which had no minimum retail price).³⁶ Ribisl and colleagues recently argued that a minimum tobacco price law, together with a floor price, could reduce under-shifting and that regular increases in the minimum tobacco price could eventually eliminate Super Value and Budget price partitions.¹²

While a minimum retail price would likely reduce tobacco consumption, revenues from this strategy would accrue to retailers and manufacturers, rather than to the government. Although tobacco companies are thus less likely to oppose this measure (relative to excise taxes), few policy makers would wish to enhance the tobacco industry's profits. Consequently, some tobacco control advocates have proposed setting industry pre-tax prices, to which they propose adding excise taxes, or establishing a minimum excise tax.^{12 37 38} For example, Scollo and Branston propose setting a maximum wholesale price alongside excise tax increases, where any increased industry profits would be paid to the government.³⁹ Moving control over pricing from the industry to government would also enhance monitoring of industry cost structures and build on licensing requirements, such as imposing conditions on tobacco sales (eg, limiting pack numbers sold in a single transaction).³⁹ Regulation of tobacco prices could thus prevent under-shifting, while also reducing tobacco companies' ability to profit from the policy.

Setting minimum retail prices or excise tax would give effect to government policy, but would affect people on lower incomes, among whom smoking prevalence is greater.⁴⁰ Policies providing enhanced, targeted support to people who smoke should therefore accompany measures that increase tobacco costs. Such an approach would increase self-efficacy and successful cessation among the many people who regret ever having started smoking,⁴¹ and respond to calls for support that people from these communities have made.^{42 43}

Like all studies, ours has strengths and weaknesses. As explained in online supplemental file 1, inconsistencies in the data analysed required us to make judgements; we have documented and justified our approaches but had no control over the data quality. Our approach to identifying price partitions differs from the methodology employed in studies using tobacco companies' descriptions of their brand profiles. Our analyses were based on one reported price per year; because tobacco companies may change prices several times in a year, we may not have detected

excise tax price shifting within years. However, our price partitions have strong face validity and the patterns identified are consistent with those found in other high-income countries. Furthermore, because NZ's tobacco control legislation prohibits price discount promotions on tobacco products, we believe the prices analysed accurately reflect retail prices and provide robust insights into tobacco price trends in NZ. However, our findings give rise to new questions, such as whether and how price manipulation occurs within as well as between brands; future research could explore this question.

Both centre-right and centre-left administrations have used regular, large increases in tobacco excise taxes to progress the Smokefree 2025 goal. However, tobacco companies have undermined this strategy by introducing new Super Value and Budget brands, by pricing strategies that increased the differentials between these price partitions and Everyday and Premium brands, and by under-shifting of excise tax increases post-plain packaging. These measures increased the market share of cheaper brands and dampened the impact of tobacco excise and plain packaging policies, thus undermining the goal of reducing smoking prevalence. Although a discussion document setting out proposed measures to achieve NZ's Smokefree 2025 goal recognised minimum retail pricing could reduce price manipulation, the final Action Plan did not include a minimum retail pricing strategy.^{44 45} Our findings suggest including a minimum pricing policy in NZ's proposed legislation would close a long-standing policy loophole and counter tobacco companies' attempts to thwart government policies designed to protect public health.

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Contributors PG and JH conceptualised the study. PG and KG undertook the data analyses. PG and JH wrote the manuscript. JRB advised on analyses and, with RE and NW, commented on advanced drafts. PG and JH led the revisions with input from all authors. All authors have approved the final manuscript. PG is the guarantor.

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Supplementary File 1: Calculating Tobacco Market Price Partitions

Discrepancies in the data provided by the tobacco companies required some alignments before analyses could proceed. For example, BAT prices submitted to the New Zealand Ministry of Health were actually prices for January in the following year (except for 2020, when the prices were for October), but were consistent with the Imperial and Philip Morris prices for the previous year. Philip Morris consistently provided between two and four prices for each year, as did Imperial in three years. Often, but not always, these prices changed (increased) over the return year. For these returns, we used the last price in the year; i.e., the price closest to the BAT price for January in the following year. For the small number of cases where BAT brand variants were delisted during a year and no retail price was provided, we assigned the same retail prices as a 20-stick pack of the same brand. In 2017, BAT reported the same prices as in 2016, which would seem to be an oversight. Consequently, we imputed BAT prices for 2017 by averaging the prices for 2016 and 2018.

Assigning the same retail price as the 20-stick pack to all pack sizes within that brand family enabled us to include the total sales volumes for these brands in our analyses. Our approach assumes that cigarette brands are ‘positioned’ in consumers’ minds in a particular price partition, or segment, regardless of pack size or the fact that unit stick prices vary by a few cents because of volume discounts. In other words, the fact that consumers could save a few cents per stick by buying a larger pack does not change a brand’s market ‘positioning’, which is determined by the price of its 20-pack relative to the price of a 20-pack of other brands.

This point is illustrated by the extract shown in Table 1, which comes from a table of factory-made tobacco brands by market segment reported in Scollo, *et al.* (2015). A similar table illustrating the same point is found in Scollo & Winstanley (2021). In studies by Scollo *et al.*,

and Gilmore *et al.*, the allocation of brands to partitions was based on comprehensive searches of trade publications to determine how the tobacco industry ‘positioned’ its brands. This information is not available in New Zealand, thus we based our price partitioning on the relative retail prices of 20-packs of each brand sold.

Supplementary File 1 Table 1: Australian factory-made cigarette brands by market segment and manufacturer: 2012-2014

Premium FMC	Mainstream FMC	Budget FMC
British American Tobacco Australia		
Benson & Hedges 20s, 25s	Winfield 20s, 22s	Holiday 20s, 22s, 25s, 30s, 40s, 50s
Cambridge 35s, 30s		Just Smokes 22s, 25s, 30s
Craven A 25s		Pall Mall 20s, 23s, 25s, 30s, 35s
Dunhill 20s, 25s		Stradbroke 40s
Kent 20s		
Rothmans 20, 25s		
Vogue 20s		
Wills 35s, 30s		
Imperial Tobacco		
Camel 20s, 25s	Escort 20s, 21s, 25s, 26s, 35s	Brandon 40s
Davidoff 20s		Horizon 20s, 21s, 30, 40s, 50s
More 20s		JPS 10s, 21s, 25s, 26s, 40s
Peter Stuyvesant 20s, 25s, 26s		Red Fortune Bamboo 20s
Philip Morris Ltd		
Alpine 25s	Longbeach 20s, 25s, 30s, 40s	Bond Street 20s, 26s
Marlboro 20s, 25s	Peter Jackson 20s, 25s, 30s	Choice 20s, 25s, 40s
		GT 40s

Source: Scollo, M., Zacher, M., Coomber, K., Bayly, M., & Wakefield, M. (2015). Changes in use of types of tobacco products by pack sizes and price segments, prices paid and consumption following the introduction of plain packaging in Australia. *Tobacco Control*, 24(Suppl 2), ii66-ii75.

We treated each normalised 20-pack brand price as an independent data point for the cluster analysis; theoretically, a brand could be allocated to any of the clusters produced, depending on its normalised price in a particular year relative to all other normalised prices. A given

brand could thus be allocated to different clusters in different years. These outcomes may have reflected deliberate pricing decisions made by the tobacco companies or simply ‘noise’ in the data. Consequently, assuming the latter had occurred in some cases, after cluster-analysing the normalised prices as described, we reviewed each cluster for each year to assess the face validity of the clustering result and re-allocated a small number of cases to correct what appeared to be marginal partition anomalies.

In 2010, we re-allocated GT to the Super Value partition even though its price was the same as two other brands in the Budget partition. This re-allocation was done because in each of the next five years GT was clustered into the Super Value partition. Similarly, Longbeach was re-allocated to the Super value partition in 2010 and 2011 because it was a Super Value brand for the following nine years, and Lucky Strike was re-allocated from the Everyday partition to the Premium partition in 2018 because it had been a premium brand for each of the previous eight years, and Davidoff was re-allocated from the Everyday to the Premium partition in 2011 and 2012 to be consistent with its positioning in 2010 and 2013. These minor re-allocations gave a more consistent brand pattern, but overall made relatively little difference to the composition of the calculated partitions.

We omitted the Vogue brand from the cluster analysis because its price was an extreme outlier, though we included it in the Premium partition after the rest of the analysis was completed.

The brands allocated to each price partition are shown in Table 2. In the table, the colour shading of retail prices denotes the price partition for each brand, and the colour of each

brand name highlights the manufacturer. Thus, for example, in 2017, Winfield Select (from BAT) was categorised as a Budget brand, not an Everyday brand. Missing values indicate that the brand was not sold in New Zealand in that year.

Supplementary File 1 Table 2: Cigarette market partitions 2010-2020

Partition	Actual Recommended Retail Price of 20 Pack										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Super Value											
Longbeach	10.20	12.00	13.50	14.50	16.00	18.20	20.00	22.00	24.50	27.50	29.20
GT	10.00	11.80	13.00	14.00	15.50	17.50					
West				14.50	15.80	18.20	20.00	22.00	24.50	27.50	29.90
JPS Full Taste		11.80	13.00	14.90	16.50	18.70	20.40	23.00			
Choice						17.50	19.50	21.50	23.90	26.90	28.90
Eight-90	8.90										
Fortune Bamboo		11.30	13.40								
Classic		11.80									
Chesterfield										25.50	28.40
Marlboro Crafted											28.90
Rothmans London											28.90
Rothmans Royals										25.50	29.90
Budget											
JPS	10.00	12.00	13.80	15.60	17.00	19.50	21.00	23.00	26.00	29.50	33.50
Horizon	11.50	12.60	14.40	16.20	18.60	20.90	22.90	24.50	23.90	26.90	28.90
John Brandon	11.20	12.50	13.60	15.40	17.00						
Peter Jackson	10.50	12.00	13.80	15.60							
Club					17.90	19.50	22.00	24.80	27.50	30.90	30.90
Rothmans					18.20	20.20	22.50	25.20	27.90	28.50	31.90
Pall Mall Amber	10.00	14.50									
JPS Long								23.00	25.00	28.50	29.50
Horizon Mellow								25.00			
Winfield Select								26.30	26.90	29.90	29.50

Everyday											
Pall Mall Baseline	12.00	13.80	15.60	16.00	19.20	21.60	23.90	26.90	29.90	33.50	33.90
Freedom	12.00	13.60	14.90	15.50	18.90	21.30	24.50				
Pall Mall	12.50	14.50	15.60	17.80	20.20	22.10	24.50	28.00	31.50	35.00	35.50
Camel		14.30	15.90	17.80	18.80	21.40	24.00	26.50	28.90	32.00	35.90
Holiday	12.60	14.40	16.20	18.00	20.90	22.80	25.00	28.00	29.90	33.50	33.90
JPS Superkings	12.90	13.90	15.90	15.60	17.00	19.50	21.60	23.80			
Marlboro	13.00	14.30	15.90	17.50	19.30	21.50	23.90	26.30	28.90	32.30	35.90
Peter Stuyvesant	13.00	14.20	15.90	17.80	19.20	22.20	23.90	26.30	28.90	32.00	35.90
Freedom Black	11.80						23.90	26.90	29.90	33.50	
Freedom Red			15.40	16.00							
Pall Mall Baseline Extra Kings				16.00	19.50	21.90	24.20	26.90	28.90	33.50	
Holiday Escape	12.00	13.80	15.40	15.00	18.20	20.20					
Holiday Supers			16.20	18.00	21.20	23.00	25.50	28.00	29.90		
Premium											
Winfield	13.50	15.30	17.20	18.40	21.50	23.90	26.30	29.20	32.00	35.00	35.90
Benson & Hedges	14.20	15.90	17.80	19.00	22.20	24.50	26.90	29.50	32.00	35.50	35.90
Dunhill	14.50	16.00	17.90	19.20	22.50	24.60	26.90	29.50	32.00	35.50	35.90
Rothmans Kingsize /Premium	14.50	16.50	18.40	19.90	22.90	25.00	27.50	30.30	33.00	36.50	36.90
Lucky Strike	14.20	16.20	18.20	19.70	22.90	25.90	28.50	28.50	28.50		
State Express 555	14.50	16.50	18.40	19.90	22.90	25.20					
Vogue	17.60	19.70	21.60	23.20	26.00	28.00					
Kent	14.40	16.40	18.20	19.70	22.90						
Topaz	14.50	16.50	18.40	19.90							
Cameo	14.50	16.50	18.40	19.90							
Davidoff	14.00	15.00	16.50	18.50							
Sportsman	13.70	15.50	17.20	18.40							
Pacific No. 1	13.40	15.50									

Imperial Tobacco brands

Philip Morris International brands

British American Tobacco brands

Improvements to Data Collection

While we believe the data provided by tobacco companies have enabled important insights, we have also identified anomalies that complicated our analyses and that policy agencies could address by stipulating tobacco companies provide data in a specified format. We suggest the following improvements would facilitate use of these data to monitor industry practices and changes in the tobacco market structure.

- Standardising the format could be simplified by providing tobacco companies with a template that requires data to be provided from the beginning of each calendar year.
- Where more than one price has applied in a given calendar year, the template would allow the date (or dates) of post 01 January price changes and separate entry of all products released after the price change.
- The template would be electronic, thus greatly facilitating use of the data (and reducing the need for data entry and verification, as currently occurs when data are provided in PDF files).
- Where brands are delisted, the date on which they were no longer released should be supplied.

Supplementary File 2: Tobacco Excise Taxes and Consumers Price Index: 2010-2020

Year	Excise Tax¹ (cents per stick)	Consumers Price Index: 2010 Q4 Base²
2010 ³	34.587	1.000
2011	38.614	1.045
2012	44.210	1.060
2013	49.011	1.070
2014	54.539	1.086
2015	60.590	1.089
2016	66.851	1.094
2017	73.813	1.117
2018	82.658	1.130
2019	92.487	1.146
2020	103.090	1.175

1. Source: New Zealand Customs, www.customs.govt.nz/about-us/news/importantnotices/new-excise-duties-rates-for-tobacco-and-tobaccoproducts
2. Source: StatsNZ, <https://www.stats.govt.nz/indicators/consumers-price-index-cpi>
3. Increase in 2010 on 29 April. Increase in all other years on 1 January.

Supplementary File 3: Analysis of Tobacco Pack Size Distribution**Supplementary File 3 Table 1: Tobacco pack size distribution 2010-2020**

Pack size within market partition	Percent of Pack Sizes (%)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Super Value											
20	44.4	47.6	60.0	63.6	75.0	70.6	70.6	55.0	34.4	73.1	63.6
25						5.9	5.9	30.0	28.1	26.9	36.4
30	22.2	19.0	20.0	18.2	6.3	5.9	5.9	5.0	12.5		
40	22.2	33.3	20.0	18.2	18.8	17.6	17.6	10.0	25.0		
60	11.1										
Budget											
20	34.3	25.0	18.9	16.2	29.7	29.4	27.8	32.0	42.4	60.0	63.3
21	8.6	5.0	8.1	16.2	16.2	17.6	16.7	12.0			
25	20.0	22.5	24.3	18.9	10.8	8.8	11.1	24.0	27.3	40.0	36.7
26			8.1	8.1	8.1	8.8	8.3	6.0			
30	28.6	25.0	18.9	18.9	18.9	17.6	19.4	14.0	12.1		
31	8.6	2.5									
40		7.5	8.1	8.1	16.2	17.6	16.7	12.0	18.2		
50		12.5	13.5	13.5							
Everyday											
20	41.0	42.0	42.5	50.0	48.6	53.4	52.1	46.8	55.8	60.0	66.7
25	20.5	27.5	26.0	21.6	22.2	22.4	22.9	29.8	20.9	30.0	33.3
26	3.8										
30	20.5	21.7	20.5	17.6	13.9	13.8	16.7	14.9	14.0	10.0	
40	5.1	1.4	4.1	4.1	4.2	5.2	6.3	6.4	7.0		
50	5.1	7.2	6.8	6.8	11.1	5.2	2.1	2.1	2.3		
52	3.8										
Premium											
20	69.4	73.9	77.3	73.7	69.0	69.0	57.1	57.1	57.1	70.0	68.4
25	22.6	21.7	22.7	26.3	24.1	24.1	33.3	33.3	35.7	30.0	31.6
30	1.6	2.2									
40	1.6	2.2									
50	4.8				6.9	6.9	9.5	9.5	7.1		