frontier economics

Econometric analysis of the New Zealand Retail Grocery Sector

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1   Executive Summary

As part of its market study in the grocery sector of New Zealand, the Commerce Commission commissioned Frontier Economics to undertake some econometric analysis to examine how the structure of local grocery markets affects prices and margins in New Zealand. This report is the result of that analysis.

Economic theory suggests that the structure of a market is likely to influence the prices and margins in a market. Key elements of market structure are:

- the number and size distribution of independent sellers, especially the degree of market concentration;

- the height of barriers to entry, that is the ease with which new firms may enter and secure a viable market;

- the extent to which the products of the industry are characterised by extreme product differentiation and sales promotion;

- the character of "vertical relationships" with customers and with suppliers and the extent of vertical integration; and

- the nature of any formal, stable and fundamental arrangements between firms which restrict their ability to function as independent entities.[1]

Economic theory yields a large range of propositions concerning the relation between elements of market structure and prices/margins. However, our analysis consisted of two studies, each of which focused on a particular issue.

The first study tested whether there is a relationship between concentration and prices in local grocery markets. We conducted the test by comparing the way in which variations in concentration across local grocery markets are related to variations in prices. We controlled for various other factors that may influence variations in prices across markets.

We were provided with weekly store-level stock-keeping unit (SKU) data for 694 stores of the major grocery retailers: Foodstuffs North Island, Foodstuffs South Island, and Woolworths NZ. The stores were those from the following banner groups of Foodstuffs: New World, PAK'nSAVE and Four Square; and it covered the following banner groups of Woolworths NZ: Countdown, FreshChoice and SuperValue.

We define a separate market around each of the 694 stores in our sample and we use two different methods to measure market concentration. The first measure is the share of revenue of the group to which the focal store belongs, when these shares were weighted to account for the distance of competitor stores to the focal store. The second measure is the proximity of the closest store of each of the six banner groups in the study.

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[1]   Decision of the Australian Trade Practices Tribunal (1976) ATPR 40-012 at 17,246. These words were adopted by New Zealand courts from the earliest cases under the Commerce Act. See, for example, *Auckland Regional Authority v Mutual Rental Cars Ltd & Ors* (1988) 2 NZBLC at 103,061.

We conduct separate tests for each of the banner groups. The results of the tests vary somewhat depending on the measure of market concentration. In models with weighted revenue share as the concentration variable, we find that increased concentration in local markets tends to be associated with higher prices in the cases of Four Square, New World and SuperValue. In models with Proximity to major banners as the concentration measure, we find that Four Square stores tend to have lower prices when a FreshChoice or SuperValue store is nearby; and Countdown, FreshChoice and SuperValue stores tend to have lower prices when a New World store is nearby. Relationships between stores of other banners are less clear. We find that Proximity to stores of non-competitor banners in the same group tends to increase prices for certain pairs of stores but not for others. In particular, prices at Four Square stores tend to be higher if a PAK'nSAVE store is nearby; and prices at SuperValue stores tend to be higher when a Countdown or FreshChoice store is nearby.

The second study analysed the impact of the entry, exit or rebranded entry on the prices charged by close competitor stores in the 12 months following the event. We used a sample of 32 events of entry, exit or rebranding. These events had a good geographic spread with different demographic characteristics, such as population density. We found that most of these events had no economically-significant impact – where an economically-significant impact was defined as at least 0.5% price change (increase or decrease). Of the 9 cases with an economically-significant impact, two were positive (such as entry associated with a price increase) and seven were negative. The absolute magnitude of the impact of every event on the prices of the close competitor stores was less than 2.25%. We find that there is no systematic relationship between the entry or exit of a store and the prices charged by close competitor stores in the 12 months after entry.

2   Introduction

On 17 November 2020, the Commerce Commission commenced a market study into the factors that may affect competition for the supply or acquisition of groceries by retailers in New Zealand. The study accords with Terms of Reference included in the Gazette Notice published by the Minister, Hon Dr David Clark, Minister of Commerce and Consumer Affairs, pursuant to section 51(1) of the Commerce Act (1986).

As part of its market study, the Commerce Commission entered into a contract with Frontier Economics in February 2021 to undertake an econometric analysis to examine how the structure of local grocery markets affects prices and margins. This econometric analysis was designed to feed into the Commission's conclusions on the factors affecting competition in the supply or acquisition of grocery products by retailers in New Zealand.

Frontier Economics began work on this project on 15 February 2021. The work was assisted by an advisory group nominated by the Commerce Commission. Although we are grateful for the advice we received, Frontier Economics takes full responsibility for the design and results of our analysis.

The analysis attempts to answer two questions that arise when considering competition in local grocery markets:

1. What is the relationship between market concentration in local grocery markets and the prices or margins earnt by retail outlets that supply those markets?

2. What is the impact on prices in local grocery markets of the entry and exit of new and rebranded supermarkets owned or serviced by Foodstuffs and Woolworths NZ?

This report presents the outcomes of our study in response to these two questions. Section 3 presents our study of the relationship between market concentration and prices/margins. Section 4 presents our study of the relationship between entry/exit and prices.

3   Relation between concentration and prices/margins

The first study requested by the Commerce Commission was an econometric analysis to test whether there is a relationship between concentration and price and/or margins in local grocery markets.[2] We responded to this request by proposing to compare the way in which variations in concentration across local grocery markets is related to variations in prices. We refer to this analysis as cross-section analysis because we examine variation across markets during a particular period.

Although the first study focuses on the relationship between concentration and prices in local grocery markets, grocery retailers compete in a range of ways. One of these is the location of the store. However, there are many others, such as:

- the size of the store

- the availability of carparking

- the products stocked in the store

- the quality of service provided within the store.

Customers come to recognise that the banner group to which a store belongs is an indication of many of these characteristics.

In order to test for a possible relationship between concentration and prices, we have to make sure, as far as possible, that variation in prices is not attributed to concentration when it is caused by other factors. For this reason, we needed to control as far as possible for variations in prices that might be attributed to variations in these other aspects of competition.

3.1   The raw data

We chose the 12 months of 2019 as the period for our analysis. The 12-month period enabled us to abstract from the effects of seasonality and weekly specials.[3] The average price of each stock-keeping unit (SKU) in each store over the year was calculated by dividing the revenue the store received from the sale of the SKU by the number of units of that SKU that were sold.

In order to undertake the analysis, we required this data from each grocery store in each local market in New Zealand. We were provided with data from stores of the major grocery retailers: Foodstuffs North Island (FSNI), Foodstuffs South Island (FSSI) and Woolworths NZ (WW). The data covered the following banner groups of Foodstuffs: New World, PAK'nSAVE and Four Square; and it covered the following banner groups of Woolworth NZ: Countdown, FreshChoice and SuperValue. We refer to the stores from these banner groups as Supermarkets.

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[2]   Commerce Commission, Request for Proposals, p 7.

[3]   Using data from 2019 enabled us to avoid any distortions in relationships that may have been caused by the COVID-19 pandemic.

The Commerce Commission provided us with the following data for each Supermarket in our six banner groups:

- the address and brand of each Supermarket;

- the revenue, number of units sold and cost of goods sold for each stock-keeping unit (SKU) sold by each Supermarket for 2019;

- the characteristics of each SKU, such as the barcode, article description, units of measurement, internal article numbers, internal department, and, for some Supermarkets, further descriptions, including product category and subcategory

- store financial accounts; and

- various store characteristics for each Supermarket, such as store size, opening hours, date of store opening, date of most-recent renovation, number of checkouts (self-service and assisted).

The Commerce Commission also provided us with a non-exhaustive list of grocery retailers other than the Supermarkets, together with addresses. We use this information to see whether the presence of these retailers in local markets affected the prices charged by the Supermarkets.

As we observed above, the Commerce Commission had requested an econometric analysis to test whether there is a relationship between concentration and price and/or margins in local grocery markets. Although the Commerce Commission provided us with store-level data of financial accounts and cost of goods sold (COGS), we decided to confine our analysis to test whether there is a relationship between concentration and price. We avoided the use of the financial accounts data because the economics literature casts doubt on the utility of financial accounts data for assessing economic profits.[4] We avoided the use of the COGS data because it recorded the cost to individual stores, where these costs appeared to include the cost of transport and corporate overheads. Because the allocation of these costs may have differed between the majors, between banners within a major or between stores within a banner, we decided to confine our analysis to differences in prices.

We chose to use the barcode as the unique product identifier, for each Supermarket banner. For some banners this required adjustments of quantities so that the units of measurement were on a consistent basis. This was accomplished using both units of measurement conversion tables supplied by the banners, but also by comparisons of prices for the same product.

We wanted to ensure that the prices we were comparing were prices for products with the same physical characteristics. For this reason, we excluded from our analysis the prices of:

- fresh fruit that was not packaged and identified with a brand name;

- fresh vegetables that were not packaged and identified with a brand name; and

- fresh meat that was not packaged and identified with a brand name.

We did this by exporting the article descriptions of all products in the butchery and produce departments, and manually examining the names. If a name indicated that the product was clearly a branded item, we retained the product, otherwise the product was excluded.

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[4]   A seminal paper is Franklin M Fisher and John J McGowan, "On the Misuse of Accounting Rates of Return to infer Monopoly Profits," American Economic Review, Vol 73 (1983) pp 82-97.

We retained products with a 13-digit barcode; products with a barcode containing fewer than 13-digits were often internally assigned by individual Supermarkets and so were less likely to be comparable across Supermarkets.

For SuperValue/FreshChoice, we observed that, for the non-hosted data[5], barcodes were often associated with multiple article descriptions. Examination revealed that in many circumstances the article descriptions were substantially different. Because the number of barcodes/articles was large (150,000) manual checks were infeasible, and we instead retained the article that had the highest revenue for each barcode.

We eliminated the products that were associated with recharge cards, gift cards, payphone cards, donations/promotions and Christmas club cards. Further, we omitted products labelled as department key (i.e. manually entered products). We also omitted products in the florist/gardening department as the descriptions indicate that these may not be comparable across stores. Finally, we omitted prescription pharmaceuticals and HealthPac payments.

We retained the department for each product so that Alcohol and Tobacco products could be identified and removed at later stages of the analysis. We wished to focus our analysis on core grocery products (not including prescription pharmaceuticals, alcohol and tobacco). This is because we considered that if we were to test whether there is a relationship between concentration and price in local grocery markets, we were more likely to discover such a relationship in core grocery products than if a possible relationship in those products was obscured by including prescription pharmaceuticals, alcohol and tobacco, where competition with specialised retailers could potentially be more direct.

3.2   Characteristics of stores in the analysis

The cross-section study tested whether the prices charged by the Supermarkets in 2019 were related to concentration in their respective local markets. We analysed the prices of 694 Supermarkets.

This section of the report presents data summarising the activities of the stores in our sample. As observed above, we did not include certain products in our analysis. The data in this section omits the products that we excluded, but it includes alcohol and tobacco.

Table 1 shows how the stores in our sample are distributed by banner and by Island. **Table 2** shows how the stores are distributed by type of area according to Stats NZ. Four Square stores are the most numerous, followed by Countdown and then New World.

We use the following abbreviations for the banners:

- Countdown – CD

- FreshChoice – FC

- New World – NW

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[5]   We understand that, because Woolworths NZ do not own any of the SuperValue or FreshChoice businesses, Woolworths NZ only store SKU level data centrally (host-supported data) for approximately [ ] of the products sold at SuperValue and FreshChoice. The other [ ] of the SKU level data for these stores is stored only by individual franchise owners (non-host supported data). Non-host supported SKUs do not have unique article numbers.

- PAK'nSAVE – PnS

- SuperValue – SV

- Four Square – 4SQ

As can be seen in **Table 1**, the data has a good variety of banners and locations.

Table 1: Number of stores in analysis by banner and island

Banner	North Island	South Island	Total
4SQ	175	64	**239**
CD	144	38	**182**
FC	13	18	**31**
NW	101	43	**144**
PnS	45	12	**57**
SV	25	16	**41**
Total	**503**	**191**	**694**

Source: Frontier Economics analysis of data provided by the Commerce Commission

Table 2: Number of stores in analysis by banner and type of area

Banner	Large urban	Major urban	Medium urban	Small urban	Rural settlement	Rural other	Total
4SQ	46	35	17	77	58	6	**239**
CD	32	97	25	28	0	0	**182**
FC	2	13	4	12	0	0	**31**
NW	23	56	20	45	0	0	**144**
PnS	13	29	11	3	0	1	**57**
SV	5	15	2	15	3	1	**41**
Total	**121**	**245**	**79**	**180**	**61**	**8**	**694**

Source: Frontier Economics analysis of data provided by the Commerce Commission

Table 3 shows the average revenue per store by banner. It indicates that the average Four Square store is [   ], followed by SuperValue and FreshChoice. However, while Four Square stores have [   ], and **Table 4** and **Table 5** indicate that, [   ]. **Table 5** shows that Four Square stores account for [   ] of turnover of tobacco products, but only [   ] of revenue over all products. Tobacco products account for almost [   ] of the revenue of Four Square stores, compared with [   ] for the group as a whole.

Table 3: Average revenue per store in analysis in 2019 ($'000)

Banner	All products except alcohol and tobacco	Alcohol products	Tobacco products	All products
4SQ	[			
CD				
FC				
NW				
PnS				
SV				]

Source: Frontier Economics analysis of data provided by the Commerce Commission

Table 4: Total revenue by banner in analysis ($ mill)

Banner	All products except alcohol and tobacco	Alcohol products	Tobacco products	All products
4SQ	[			
CD				
FC				
NW				
PnS				
SV				]

Source: Frontier Economics analysis of data provided by the Commerce Commission

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Table 5: Revenue share by banner in analysis

Banner	All products except alcohol and tobacco	Alcohol products	Tobacco products	All products
4SQ	[			
CD				
FC				
NW				
PnS				
SV				]

Source: Frontier Economics analysis of data provided by the Commerce Commission

3.3   Price data used in analysis

As is common with large datasets of this kind, the prices calculated from the data we received from the Commerce Commission required cleaning to eliminate prices that were clearly wrong. Examples of wrong prices were those that were negative or very small. For example:

- There were 2 negative prices, 89 cases of prices less than 1 cent, and 352 prices less than 5 cents.

- The product with EAN_barcode = [   ] was sold in 28 stores with the average price in 2019 ranging from 1 cent to $9.995. While most stores had average prices above [ ], five stores had average prices of [ ] or less.

- The product "[   ]" with EAN_barcode = [   ], had total revenue for one store in 2019 of 3 cents with the quantity sold = 3.22. The cost of goods sold was $8.39.

With over 8 million observations, it was not practical to examine all possible anomalies in the revenues and quantities. Instead, we treated a percentage of the most extreme observations as outliers and deleted them from the analysis.[6]

We implemented this approach as follows. For each product we calculated the median price for the product across the stores in each banner. We used the median price rather than mean price because of its reduced sensitivity to outliers. This provided us with a separate median price for the product for each banner.

Next, we calculated, for each product, and each store selling the product, the ratio of the price for that product to the median price of the product for the relevant banner. We then classified as

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[6] This is a common approach to dealing with outliers in large datasets.

outliers the 2% of prices that were furthest from their respective medians across all products and banners. This resulted in our treating as an outlier any price that was more than 26.0% away from its relevant median.

After cleaning the data, we were left with a large and rich dataset. There were 8,852,722 observations on revenues and quantities for store/product combinations. Of those, 662,579 observations were for alcohol or tobacco products. We are satisfied that we had a large, reliable dataset for our econometric analysis.

Table 6 summarises the distribution of stores and products that were used in the cross-section analysis. It shows, for each banner:

- the number of stores (# Stores)

- the mean number of products per store (Nproducts), together with the standard deviation, minimum number of products per store and maximum number of products per store

- the mean number of products per store that were sold in only one store (Nproducts store only), together with standard deviation, minimum and maximum number of these products per store

- the mean number of products per store that were sold only in the banner (Nproducts banner only), together with the standard deviation, minimum and maximum number of these products per store

- the mean number of products per store that were sold only in the group (Foodstuffs or Woolworths NZ) to which the banner belonged (Nproducts group only), together with the standard deviation, minimum and maximum number of these products per store.

Table 6: Number of products sold by store: All products except alcohol and tobacco

4SQ	# Products				
Variable	# Stores	Mean	Std. Dev	Min	Max
Nproducts	239	[			
Nproducts_store_only					
Nproducts_banner_only					
Nproducts_group_only					]

CD	# Products				
Variable	# Stores	Mean	Std. Dev	Min	Max
Nproducts	182	[			
Nproducts_store_only					
Nproducts_banner_only					
Nproducts_group_only					]

FC	# Products				
Variable	# Stores	Mean	Std. Dev	Min	Max
Nproducts	31	[			
Nproducts_store_only					
Nproducts_banner_only					
Nproducts_group_only					]

NW	# Products				
Variable	# Stores	Mean	Std. Dev	Min	Max
Nproducts	144	[			
Nproducts_store_only					
Nproducts_banner_only					
Nproducts_group_only					]

PnS	# Products				
Variable	# Stores	Mean	Std. Dev	Min	Max
Nproducts	57	[			
Nproducts_store_only					
Nproducts_banner_only					
Nproducts_group_only					]
SV	**# Products**				
Variable	# Stores	Mean	Std. Dev	Min	Max
Nproducts	41	[			
Nproducts_store_only					
Nproducts_banner_only					
Nproducts_group_only					]

Source: Frontier Economics analysis of data provided by the Commerce Commission

The cross-section study tests whether there is a relationship between concentration and prices in local grocery markets. It does this by testing whether differences in prices across stores are related to differences in concentration in the local markets in which those stores are located. This test will only make sense if there are material differences in prices across stores when these differences cannot be explained simply by differences in obvious characteristics such as the banner of the store. That is, the study would only make sense if there are material differences in prices between banners and within banners that might be explained by differences in concentration.

 Table 7 reports average differences in prices between the banners. **Table 7** shows the average price difference between each banner and the most-expensive banner, [   ]. It appears that [   ] stores are substantially [   ] than other banners for all product categories, other than tobacco. There are also substantial differences in average prices between some of the other banners, with PAK'nSAVE materially the [   ] in all categories, other than tobacco. Indeed, for tobacco products there are only very small price differences between the banners.

Table 7: Average price differences between each banner and Four Square

Banner	All products except alcohol and tobacco	Alcohol products	Tobacco products
[			
			]

Source: Frontier Economics analysis of data provided by the Commerce Commission

Table 8 provides estimates of the average price differences, within each banner, between stores in the North Island and the South Island. We expected to find substantial differences in prices between the North Island and the South Island because of differences in transport costs. However, the table shows that for all banners except [   ], there are only small differences in average prices between the North and South Islands. The table indicates that the prices in our analysis for [   ] stores are, on average, [   ] in the South Island than in the North Island.

Table 8: Average price difference between banner in South Island and same banner in North Island

Banner	All products except alcohol and tobacco	Alcohol products	Tobacco products
[			
			]

Source: Frontier Economics analysis of data provided by the Commerce Commission

3.4   Price differences across regions

After we had undertaken our core econometric work, the Commerce Commission's advisory group asked whether we would look more closely at differences in prices across regions (using Stats NZ

regional council definitions). **Table 9** presents the results of two different methods for considering these inter-regional differences in prices.

The first method reflects inter-regional variation within banners. This is based on the banner-specific price indices that we developed as part of our core econometric work. As we explain in section 3.4.3 below, as part of that work we developed price indices for each banner group and estimated a price index number for each store within the banner. In order to respond to the request from the advisory group, we took the price indices developed for these regressions to find price indices for each region. We obtained the regional indices from a regression containing all 694 Supermarkets as the sample with the price indices as the dependent variable, and dummy variables for the banners and regions as explanatory variables. The first method provides estimates of the average differences in prices across regions within banners.

The second method shows inter-regional variation in prices based on a national price index. Although the first method shows inter-regional variation in prices within banners, it may be that there are material differences in average prices across regions resulting from the concentration of particular banners in certain regions. For example, **Table 7** indicates that [   ] stores tend to be the [   ] stores for products other than tobacco; and **Table 2** indicates that rural areas tend [   ]. This suggests that rural areas will tend to have more expensive groceries than non-rural areas. This is picked up in our second method.

For the second method, we first obtained store price indices by comparing all stores to a base store. We then calculated the store-revenue weighted average of the price indices of the stores in each region. The weighting ensures that the results also reflect how much money people spend in each store/banner in the region. It estimates the combined effect of different prices across regions within banners, and the different availability of banners in each region.

The results of both methods are presented in **Table 9** below. The differences in the results between the two methods reflect differences in the availability of banners in different regions. The reason the West Coast is most expensive is likely due to the fact that the region contains mostly [   ] stores and no [   ] stores. The results from each method are presented in comparison with prices in Auckland.

Table 9: Regional price differences relative to Auckland

Region	Method 1 -banner-specific indices	Method 2 -national index
Auckland Region	0.0%	0.0%
Bay of Plenty Region	-0.6%	0.5%
Canterbury Region	-0.7%	1.7%
Gisborne Region	-1.1%	1.2%
Hawke's Bay Region	1.5%	1.4%
Manawatu-Whanganui Region	1.3%	2.1%
Marlborough Region	-0.5%	1.9%
Nelson Region	-0.7%	2.8%
Northland Region	-0.6%	3.0%
Otago Region	-1.3%	3.3%
Southland Region	-1.5%	3.1%
Taranaki Region	1.3%	2.2%
Tasman Region	-1.6%	1.9%
Waikato Region	-0.4%	1.7%
Wellington Region	1.1%	1.4%
West Coast Region	-1.9%	4.8%

Source: Data provided by the Commerce Commission

3.5   The key variables: markets, concentration and prices

Our econometric analysis proceeds by testing whether differences in prices across the 694 stores for which we obtained pricing data are related to differences in concentration in the local markets in which those stores are located. To undertake these tests, we have to define markets and adopt or develop measures of concentration in those markets. We also have to develop measures of the extent to which prices differ across the 694 stores for which we obtained pricing data.

When we test the relationship between concentration and prices, we have to be careful to control for other possible influences on prices. In this section of the report, we outline the various measures we use for the key variables. In the following section, we outline the various measures we use for control variables.

3.5.1   Our approach to defining markets

We define a separate market around each of the 694 stores in our sample. We refer to the store around which a market is defined as the focal store for that market. The market for such a focal store will include all those stores which exercise a constraint on the prices, range or quality of service of the focal store.

Our focal stores are the 694 stores for which we obtained pricing data. The cross-section study was designed to test whether the prices charged by these stores were related to concentration in their local markets. For this reason, a market needed to be defined for each of the 694 focal stores.

The most-obvious competitors for a Supermarket are other Supermarkets; but competitors may also include pharmacies, pet shops, liquor stores, general merchandise stores, butchers, greengrocers and so on for individual product categories. The range of products stocked by other stores within the market of a focal Supermarket may be termed the product dimension of its market.

There is also a geographical dimension to the market of any focal store. The constraint of a competitor is likely to be greatest for stores close to the focal store; and it decreases for stores located further from the focal store. Stores that are so far away as to exert no material constraint on the focal store should not be included in that store's market.

We define the geographic scope of each market in terms of driving distance, that is, the time it takes to drive from one location to another. We used the average drive time according to Google Maps API as our measure of drive time. Thus, the geographic boundaries to the market for any particular store are expressed in terms of an isochrone centered on the relevant focal store.[7]

As an example, **Figure 1** provides drive times (in seconds) between major Supermarkets and New World Pioneer, the red area is the 10-minute isochrone.[8] We define a Proximity measure as the drive time between the focal store and the competitor store, expressed as a percentage of the drive time of the isochrone. For example, if one were to consider a 10-minute (600 second) radius of the spatial competition market, the closest New World would be 474 seconds away, so within the market, with a Proximity of 21%. The closest Countdown, PAK'nSAVE and Four Square Supermarkets are 292, 276, and 312 second away respectively, with proximities of 51%, 54% and 48%. There are no SuperValue or FreshChoice Supermarkets within 10-minutes, so these banners receive Proximity scores of zero.

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[7]   Because the radii of the Google isochrones are specified in terms of drive time instead of distance, the physical size of the isochrones for local markets will vary by the type of area, with isochrones in rural areas likely to be considerably larger than isochrones in large urban centres.

[8]   The isochrone is for illustrative purposes only; drive times using Google Maps API are used to derive Proximity.

Figure 1: Drive times to New World Pioneer
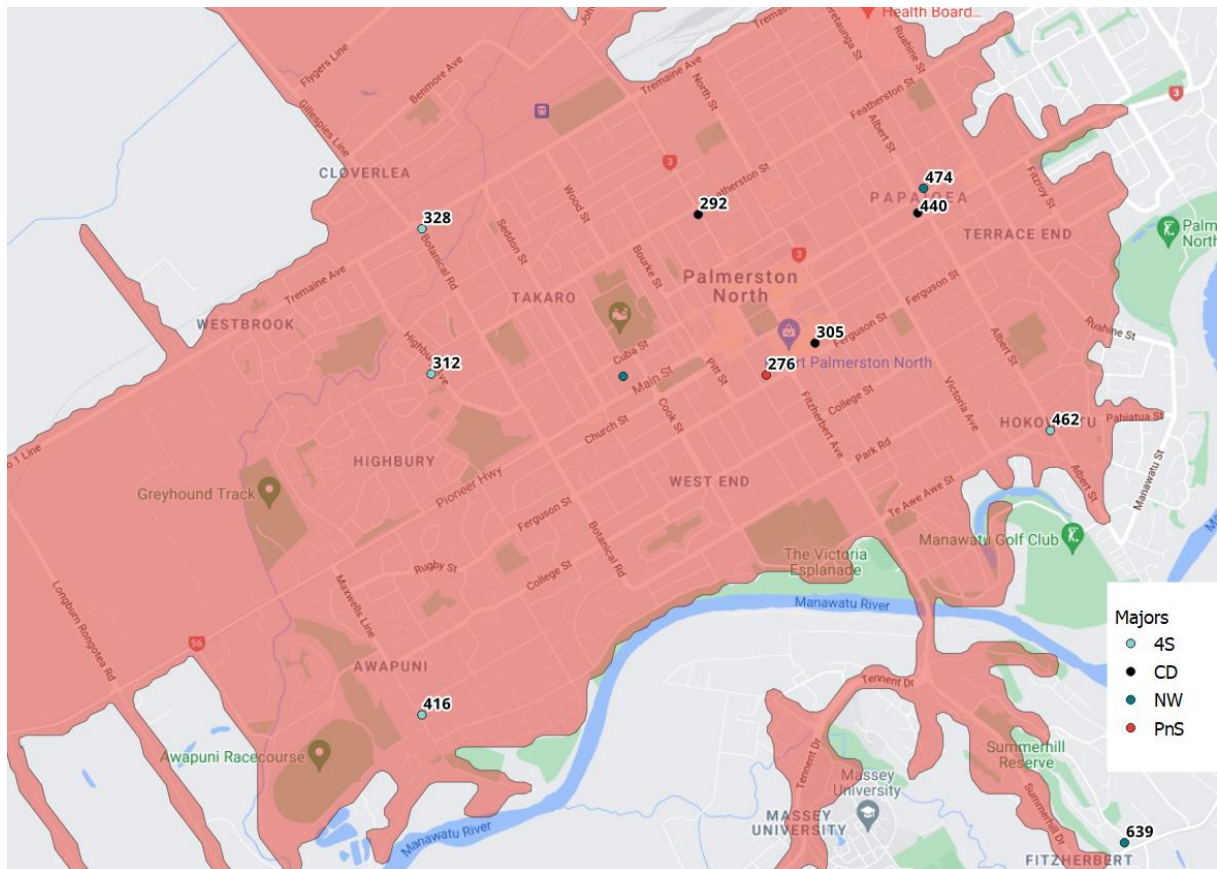
Source: Frontier Economics, HERE, Google Maps

We consider four possible 'radii' for these isochrones; 5, 10, 15 and 20 minutes' drive time. We allowed the appropriate isochrone for any particular market to be decided by the data; that is, the appropriate geographic boundaries to any particular market are those that best fit the relationship between prices and concentration.

Analysis of competition is frequently presented as if the first step is to define the relevant markets, followed by examining the structure of those markets (including market concentration) and, finally, the impact of the structure of the markets on aspects of their performance (such as prices) is analysed. Although this may be the way the analysis is presented, it is rarely undertaken in this order.

The relationship between market definition and market power was considered by the High Court of Australia in *Queensland Wire Industries Pty Ltd v Broken Hill Pty Co. Ltd*. In their joint judgment, Mason C.J. and Wilson J. said:

> The analysis of a s.46 claim necessarily begins with a description of the market in which the defendant is thought to have a substantial degree of power. In identifying the relevant market, it must be borne in mind that the object is to discover the degree of the defendant's market power. Defining the market and evaluating the degree of power in

that market are part of the same process, and it is for the sake of simplicity of analysis that the two are separated.[9]

Consistent with this approach to market definition, we adopt markets in our econometric analysis that are themselves derived from that analysis. They are the markets that best fit the models that describe the relationship between concentration and prices.

3.5.2   Measuring concentration

As we observed above, the constraint of a competitor is likely to be greatest for stores close to the focal store; and it decreases for stores located further from the focal store. For this reason, measures of market concentration in retail markets are frequently adapted to take account of the proximity of competitors to the focal store.

We considered three alternative approaches to capturing the level of concentration in the local market. The first was the weighted share of the stores in the major grocery retailers (Foodstuffs, Woolworths NZ) to which the focal store belonged. For each of the considered radii (5, 10, 15- and 20-minutes' drive time) we derived market shares of the major by first taking all member stores within the spatial market and deriving distance weighted revenue shares of each major.

To derive distance weighted shares of each major, we summed the distance weighted shares of stores within each major (Foodstuffs or Woolworths NZ) within the drive time radius considered. We obtained the distance weighted revenue[10] of each store by multiplying the revenue by the normalised Proximity of the Supermarket to the focal Supermarket. That is, a Supermarket at the centre of the spatial market would have revenue weighted by 100%, but the weighting would reduce to 0% at the boundary of the spatial market.[11] [12]

The second approach we considered was the Herfindahl-Hirschman Index (HHI). We regarded this approach as less useful than the first for two reasons. In the first place, if one uses the HHI when there are only two major competitors, the HHI does not distinguish between a market in which the focal firm has the major share and a market where the focal firm has a relatively minor share. Secondly, the HHI (when applying distance weighted shares) is a function of the share of the major to which the focal Supermarket belongs in a duopoly.

Our third approach to market concentration deals more-directly with the differentiation of stores by location. In this approach, we specify for each focal Supermarket a variable equal to the drive time to the closest Supermarket of each of the six banners in our analysis, and normalise the variable so that the normalised Proximity is equal to 1 if the competitor Supermarket is 0 seconds drive time from the focal store, and 0 if the competitor Supermarket is at the edge of the

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[9]   Queensland Wire Industries Pty Ltd v Broken Hill Pty Co. Ltd [1989] HCA 6; para 187. (1989) 167 CLR 177.

[10]   Revenue was taken as the sum of revenue in the cross-sectional data. Our measures of market concentration could only include the stores for which we had revenue data, i.e. the Supermarkets used in the cross section analysis. We test for competition from other grocery retailers in our regressions.

[11]   More specifically, if a Supermarket is x seconds from the focal Supermarket, the weighting applied to the Supermarket's revenue under a 5-minute radius is $\max\left(0, \frac{5*60-x}{5*60}\right)$.

[12]   Similar approaches to shares, which may impact pricing through their impact on diversion ratios, have been applied by the competition regulators. For example, see CMA (2016), A report on the anticipated acquisition by Celesio AG of Sainsbury's Pharmacy Business, Appendix I.

isochrone or beyond in terms of drive time.[13] Thus for each focal Supermarket, we can measure the proximity to the closest store from each of the six major banners with six variables between 0 (i.e. not in the market) and 1 (at the centre of the market). This includes the closest store from the same banner as the focal store. We refer to this measure as the Proximity measure of market concentration; it measures how close in geographic space the closest store from each of the major banners is to the focal store.[14] We investigated these measures for each of the four different radii (5, 10, 15 and 20 minutes).

We also investigated some variations of the Proximity measure. In the first we include, in addition to the Proximity to the six major banners, the Proximity to the closest other supermarkets,[15] the closest international supermarkets, the closest butcher and the closest bulk food store. In the second variation we include the Proximity of the closest store to each of the above, and also the Proximity to the closest "The Warehouse" retail store, the closest "Chemist Warehouse" retail store and the closest convenience store. These models were typically not preferred over the model featuring Proximity to only the major banners. In the third variation, we use both the six major proximity variables, but also include the proximity to the second closest store of each banner. In the end, we rejected these variations because they did not fit the data as well as that using only the Proximity to the closest of each of the six major banners.

3.5.3   Measuring differences in prices

We estimate separate models for each banner group. The dependent variable in each regression model is the store price index, an index that allows comparisons of prices across stores in each banner. To derive this price index, we first estimate a fixed effects regression model for each banner separately, in which the logarithm of the price of each product and store is the dependent variable in the regression model, and product and store fixed effects are included as the sole explanatory variables. The store level fixed effects coefficients are saved as the price indices.[16]

Because we estimate separate models for each banner and test the relationship between concentration and prices with each model, we require that prices vary across stores within banners. The extent of this variation can be observed in the distribution of the price index for each store as derived above.[17] The distribution of these price indices is represented in **Figure 2** below. The median price index for each banner is set to zero. The shaded box shows the range of stores between the 25th percentile and the 75th percentile; the vertical lines show the distance between the maximum and minimum stores for each banner; and the dots represent outlier stores.

Figure 2 below shows that [   ] shows considerable variation in pricing across stores. However, the stores within each of the other banners typically lie within [ ] per cent of each other, with the exception of several outliers.[18]

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[13]   More specifically, if a pair of Supermarkets are x seconds apart, the Proximity under a 5-minute radius is $\max(0, \frac{5*60-x}{5*60})$.

[14]   If no such store is in the defined market, it is given a score of zero.

[15]   By 'fringe supermarkets', we mean general grocery stores other than the Supermarkets.

[16]   We considered using the prices of products in the cross section regression, however this proved to place greater emphasis on stores that had a higher number of products sold during the sample period.

[17]   Each banner is set to have a median (banner specific) price index of zero.

[18]   Such as [   ].

Figure 2: Distribution of price indices across stores for each banner

[   ]

Source: Frontier Economics analysis of data provided by the Commerce Commission

3.6   The control variables

We test whether differences in prices across the 694 stores for which we obtained price data are related to differences in concentration in the local markets in which those stores are located. When undertaking this testing, we have to ensure, as far as possible, that we control for other factors that may be influencing differences in the prices of the focal stores.

3.6.1   Banner group

Perhaps the most-obvious variable that might explain differences in prices across stores is the banner group to which the store belongs. As we observed in section 3.3 above, there are substantial differences in average prices between banners, with average prices for groceries (other than alcohol and tobacco) in the cheapest banner being some [   ] below the prices for these products in the most-expensive banner.

We control for differences in prices across banner groups by testing the relationship between concentration and prices separately each of the six banners.

3.6.2   Area type

We anticipated that there may be substantial differences in the cost of supplying urban compared with rural areas, and that these differences in cost of supply may lead to differences in prices. Stats NZ classifies areas into the following types: Large urban, Major urban, Medium urban, Small urban, Rural settlement or Rural other area.[19] We control for the Area Type in which the focal store is located in order to control for possible differences between urban and rural areas in the cost of supply. For the purpose of the regressions, we amalgamate areas into two categories (Urban, Rural).

3.6.3   Demographic variables

Differences in demographic characteristics across regions may affect demand for grocery products and so affect prices. We obtained data on the following demographic variables from the 2018 census data at the SA1 level from Stats NZ:

- Population (usual resident population)

- Median income

- Median age

.

- Proportion of population identifying as Maori

- Proportion of population identifying as foreign born

- Proportion of population reporting a highest qualification of Bachelor's degree/level 7 and above.[20]

For local characteristics, we constructed isochrones centered at each focal Supermarket using drive times of either 5, 10, 15 or 20 minutes.[21] We then applied these isochrone shapes to 2018 census data at the SA1 level provided by Stats NZ.[22] By calculating the overlap between the Supermarket isochrones and the SA1 areas we were able to derive the demographic characteristics of the local market to be used as control variables.

3.7   Approach to regression analysis

The cross-section analysis was carried out for each of the six major banners separately. As observed above, we removed all alcohol and tobacco products because we are primarily interested in core grocery products. Prior to estimating the regression models, we also removed price outliers identified using the approach described in section 3.3.

Our regression analysis is performed separately for each banner. We also present results for each banner using only urban stores within each banner and then using only rural stores within each banner.[23,24,25]

The model specification has the store price index as the dependent variable in the regression model, and the measures of concentration as the main variable(s) of interest on the right hand side – six variables for the closest majors, or a single weighted revenue share variable.[26] The models also have variables controlling for the area type[27] and local market demographic characteristics (population, income, age, Maori proportion, foreign proportion and graduate

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[20]   Available from https://www.stats.govt.nz/information-releases/statistical-area-1-dataset-for-2018-census-updated-march-2020

[21]   Friday 25 June 2021, 5pm. The service used, HERE API accessed via QGIS, did not have an option for 'average' traffic conditions.

[22]   Available from https://www.stats.govt.nz/information-releases/statistical-area-1-dataset-for-2018-census-updated-march-2020

[23]   We define Urban as Medium Urban Area and above.

[24]   Due to sample size, we are unable to perform all regression specifications on all banner*urban/rural subsamples.

[25]   We still retain area type dummy variables for these regressions, though in some cases there is only a single area type in the sample.

[26]   In the economic analysis of prices, it is common practice to specify prices as the logarithms of the prices. The impacts of the explanatory variables on prices can then be interpreted as percentage impacts, or, depending on the specification of the explanatory variables, as elasticities.

[27]   For this we use six dummy variables indicating if the supermarket is in a Large urban, Major urban, Medium urban, Small urban, Rural settlement or Rural other area.

proportion), which could affect costs or demand in the local market. Finally, we include the log of the store size.[28]

To determine which spatial markets are most applicable, we first estimate regression models that include only the area type and demographic variables.[29] This allows us to choose the most appropriate isochrone for demographic variables (5, 10, 15, or 20 minutes' drive time, traffic enabled or not) by choosing the drive time that yields the best model fit. We select the best-fitting models using the Bayesian Information Criterion (BIC), which involves picking the model with the lowest BIC value.[30,31]

We next add the various alternatives for the competition variables. For each of the five competition variables (weighted share, Proximity to majors, and the three expanded competitor Proximity specifications) we select the appropriate radius for competition variables (5, 10, 15 or 20 minutes' drive time). We again use the BIC criterion to select the best-fitting competition radius for each specification.

We then revisit the appropriate radius for calculating the market demographic characteristics for the best model for each of the four approaches to capturing competition in local markets.

We note that the competition measures may be endogenous – entry into local markets may be induced by profitable market conditions. To account for endogeneity, we adopt an instrumental variables (IV) approach for the weighted group shares model specification. As instrumental variables, we use the six demographic variables, the six area type dummy variables, and the unweighted share of each group within a 20-minute radius. The use share (calculated without any distance weights) within a 20-minute radius serves as the key instrument; it is highly correlated with the weighted share yet not impacted by local market conditions to the same extent.

We explored implementing the instrumental variables approach for the Proximity specifications, but we were unable to obtain suitable instrumental variables. We considered the number of stores of each banner within a 20-minute radius, analogous to the weighted share IV approach, but this proved to be a weak instrument. As a consequence, we use OLS to estimate the models with the Proximity specification; and we note the potential for endogeneity.

3.8   Regression results

We report the results for the IV approach for the specification with weighted share as a measure of concentration; and we report the OLS results for the various Proximity specifications for the concentration measure.

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[28]   Several stores did not supply this information, presumably because they were closed as at 2021. We also note that the size of some Four Square stores appears to be rounded to the nearest 100 square meters.

[29]   Since the radii of the isochrones are specified in terms of drive time instead of distance, the physical size of the isochrones for local markets will vary by the type of area, with isochrones in rural areas likely to be considerably larger than isochrones in large urban centres.

[30]   Given the large number of observations relative to the number of variables, this is essentially equivalent to selecting the model with the highest R-squared value.

[31]   We apply robust standard errors.

3.8.1   Weighted own group share

We first present the results for the specification that uses the weighted spatial market share of own group as the measure of competition.

Table 10 and **Table 11** below present the radii used to derive the weighted market share and the demographic characteristics relevant to the local market. It should be noted that the two radii are obtained from different sources and may not be directly comparable: the former is average drive time according to Google Maps API, and the latter is drive time (either with traffic or no traffic) according to HERE API. Further, any apparent inconsistencies between the two radii may be due to differences in how each element enters the pricing equation: it is plausible that characteristics of potential customers within small geographic area are relevant, though competitors outside that area may still pose a constraint on pricing.

It is interesting that we often observe that the stores in rural areas have smaller radii than the stores of the same banner in urban areas. This may be a consequence of using drive time – the radii in terms of kilometres may be substantially larger in rural areas due to lower traffic and higher road speeds. Further, it is possible that the drive time is overstated if people tend to visit supermarkets during times of lower traffic relative to that assumed by Google Maps API for the 'average drive time'.

Table 10: Selected radius (minutes' drive time) for competition – Weighted share approach

	All	Urban	Rural
Four Square	20	20	10
New World	20	20	15
PAK'nSAVE	20	20	n/a
Countdown	15	5	10
FreshChoice	20	20	15
SuperValue	15	15	15

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Table 11: Selected radius (minutes' drive time) for characteristics – Weighted share approach

	All	Urban	Rural
Four Square	20	20 (no traffic)	20
New World	10 (no traffic)	10 (no traffic)	5
PAK'nSAVE	20	20	n/a
Countdown	5	10	10 (no traffic)
FreshChoice	10 (no traffic)	15 (no traffic)	20
SuperValue	20	10	10 (no traffic)

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Table 12 presents the estimates for the impact of the distance-weighted own-group share on prices. The table shows that the impact is typically positive and significant. The estimated impacts of the weighted own-share ranges from 1.5% to 3.2% when examining the full samples. Countdown is an exception: it exhibits no significant response to the weighted own-share.

The impact of concentration can differ substantially when comparing the full samples to the urban and rural samples; however, it again tends to be positive and, with some statistically significant results. While FreshChoice and SuperValue exhibit negative impacts of concentration in the urban subsamples, it should be noted that these results are significant only at the 10% level, and also arise from small datasets: 19 and 22 observations respectively.

The coefficients imply that, as the weighted own-share increases from 0% to 100%, a focal supermarket increases prices by between 1.5 to 3.2%.[32]

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[32]   PAK'nSAVE (rural) had insufficient observations to perform the regression.

Table 12: Impact of market share of the major on prices of stores of banners within that major group

	All	Urban	Rural
Four Square	0.0166**	0.0967***	0.00934
New World	0.0149***	0.0284***	0.00119
PAK'nSAVE	0.0304*	0.0221	n/a
Countdown	0.00971	0.000623	0.0174***
FreshChoice	0.0149*	-0.0186*	0.0282***
SuperValue	0.0318***	-0.0612*	0.0339***

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

*Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively*

The estimates in **Table 12** illustrate that prices tend to be higher in local markets that contain a larger percentage of stores of a particular major grocery retailer.

Although the coefficients may seem small, a relatively small increase in prices may lead to a large increase in profits if margins are small. For example, if a banner has average gross margins of 5 per cent, a one per cent increase in average prices would result in an increase of gross profits of around 20 per cent.

The percentage increases in prices in **Table 12** are large when considered in comparison with the extent of variability in prices within banners (see **Figure 2** above).

3.8.2   Proximity of competitors

Although we considered four variations of the Proximity to competitors measure, each including dummy variables for a different set of competitors stores, we found that the specification that only includes the dummy variables for Proximity to the six major banners typically provided the best fit to the data. In three instances[33] the specification accounting for both the closest and second closest of each major banner provided the best fit.[34]

The Proximity of other competitors, namely other supermarkets, bulk food stores, butchers, and international supermarkets, did not significantly improve the model fit in most cases.[35] There were only three statistically significant coefficients for Proximity variables other than for majors.[36]

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[33]   FreshChoice (full sample), SuperValue (full sample) and Countdown (rural sample).

[34]   Further, interpretation of the six 'Proximity of second closest store within banner' variables is challenging due to the multicollinearity issue: if the second closest is very close by definition the closest is also very close.

[35]   It did improve the fit in the FreshChoice (full sample), whereby close Proximity of butchers reduced prices significantly, and Countdown (rural sample) where close Proximity of bulk foods was associated with slightly higher (and statistically significantly) higher prices.

[36]   Proximity to butchers in the FreshChoice (full sample) regression, and Proximity to a bulk foods competitor in the Countdown (full and rural samples) regressions.

We can conclude that there is little evidence that the competitors other than those of the major grocery retailers have an effect on the prices set by major banners. We do however note that non-packaged produce and butchery items were excluded from the analysis.

As in the previous section, we determined which spatial markets are most applicable in an iterative manner. Compared with the market share approach, we typically see lower radii when using Proximity to the six major banners. However, we often observe that the supermarkets in rural areas have the same smaller radius as the supermarkets of the same banner in urban areas.

Table 13: Selected radius (minutes' drive time) for competitor Proximity approach

	All	Urban	Rural
Four Square	20	20	20
New World	10	10	10
PAK'nSAVE	5	5	n/a
Countdown	20	5	5
FreshChoice	5	20	5
SuperValue	5	5	10

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Table 14: Selected radius (minutes' drive time) for characteristics – competitor Proximity approach

	All	Urban	Rural
Four Square	20 (no traffic)	20 (no traffic)	10
New World	10 (no traffic)	5	5
PAK'nSAVE	15 (no traffic)	20	n/a
Countdown	5 (no traffic)	10	10
FreshChoice	5	5 (no traffic)	5 (no traffic)
SuperValue	10 (no traffic)	10 (no traffic)	5

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Table 15 below shows the impact of the Proximity of competitor stores on prices when examining the full samples containing both urban and rural stores. It appears that much of the

rivalry is between the major grocery retailers rather than between the banners. The impact appears to depend on whether the 'competitor' is from the same group or the competing group: a [   ] being located close to a [   ] appears to be associated with lower prices at the [   ]. As the [   ] moves from being outside the market radius, to being located adjacent to the [   ], there is an implied [   ] reduction in prices at the [   ]. The impact of the Proximity of [   ] banners on [   ] banners appears to be either positive or insignificant, whereas the impact of [   ] banners on [   ] banners appears to be either negative or insignificant. Although the effects are less clear, [   ] supermarkets appear to [   ] supermarkets' prices when located nearby, and they [   ] supermarkets' prices when nearby.

Table 15: Impact of Proximity – full sample

	Proximity to major banners					
Focal store	**Four Square**	**New World**	**PAK'nSAVE**	**Countdown**	**FreshChoice**	**SuperValue**
Four Square	[0.00484	0.00544	0.0225***	-0.00467	-0.0168**	-0.0273***
New World	-0.00202	0.0161***	0.00611*	-0.000543	-0.000430	-0.00308
PAK'nSAVE	0.0102	0.00484	n/a	-0.00141	0.0130	0.00643
Countdown	-0.00187	-0.0101***	-0.00166	-0.00463**	0.000459	-0.00630
FreshChoice	0.00224	-0.0183***	0.00734	0.0000632	n/a	0.0694*
SuperValue	-0.00108	-0.0360***	-0.0224**	0.0270**	0.0684**	n/a]

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

*Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively*

3.9   Conclusions

The first study tested whether there is a relationship between concentration and prices in local grocery markets. We conducted the test by comparing the way in which variations in concentration across local grocery markets are related to variations in prices. We controlled for various other factors that may influence variations in prices across markets.

We define separate markets for each of the 694 stores in our sample and we use two different methods to measure market concentration. The first measure is the share of revenue of the group to which the focal store belongs, when these shares were weighted to account for the distance of stores to the focal store. The second measure is the Proximity of the closest store of each of the six banner groups in the study to the focal store.

We conduct separate tests for each of the banner groups. The results of the tests vary somewhat depending on the measure of market concentration. In models with weighted revenue share as the concentration variable, we find that increased concentration in local markets tends to be associated with higher prices in the cases of Four Square, New World and SuperValue. In models

with Proximity to major banners as the concentration measure, we find that Four Square stores tend to have lower prices when a FreshChoice or SuperValue store is nearby; and Countdown, FreshChoice and SuperValue stores tend to have lower prices when a New World store is nearby. Relationships between stores of other banners are less clear. We find that Proximity to stores of non-competitor banners in the same group tends to increase prices for certain pairs of stores but not for others. In particular, prices at Four Square stores tend to be higher if a PAK'nSAVE store is nearby; and prices at SuperValue stores tend to be higher when a Countdown or FreshChoice store is nearby.

4   Relation between entry/exit and prices

The second study requested by the Commerce Commission was an econometric analysis of the price and margin impact of new and rebranded entry and exit by Foodstuffs and Woolworths NZ supermarkets in local grocery markets across New Zealand, using different testing parameters to determine the boundaries of the geographic markets within which significant effects on retail grocery price and margins are observed.[37]

Whereas the first study was a cross-section analysis of the average prices charged by stores during one particular year, the second study analyses the process of competition over time. The study seeks to identify the effects of entry and exit of new or rebranded stores on prices charged by nearby Supermarket stores. We confine our analysis of effects on prices to the first 12 months after the event.

Confining our analysis of effects on prices to 12 months after the event is an obvious limitation of the study because large effects on prices might dissipate over time. A perhaps less-obvious limitation is that events of the kind we focus on in this study might give rise to longer-run changes in the structure of a local market. For example, a new Countdown store may enter a local market served by a Four Square store. The owner of the Four Square store (in conjunction with Foodstuffs) may respond by converting the Four Square store into a New World – with a consequent decrease in the prices charged in the store. Longer-term competitive effects of this kind would not be picked up in either of our studies. They would not be picked up in the first study – which takes the identity of the stores as given; and they would not be picked up in the second study because we confine our analysis of effects on prices to the first 12 months after entry.

All studies have limitations. We mention these limitations to make clear to the reader that we are aware that our studies do not exhaust the analysis of ways in which grocery retailers compete.

4.1   The data used in the entry/exit study

The second study examined the impact on prices in local grocery markets of various events: the entry and exit of new and rebranded Foodstuffs and Woolworths NZ stores. We elected to focus on events associated with larger stores. For this reason, we restricted our analysis to events involving PAK'nSAVE, Countdown and New World stores; and we included no events associated with Four Square, FreshChoice or SuperValue stores.

We identified our sample events from the file of supermarket characteristics provided by the Commerce Commission. In addition to those we identified, the Commerce Commission advisory group asked us to include in our events the entry of two stores operating under the Farro Fresh (FF) banner.[38] This provided us with 32 events of stores which entered, exited, changed location, or

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[37]   Commerce Commission, Request for Proposals, p 7.

[38]   The Commission brought these two events to our attention.

rebranded during the period 1 April 2016 to 31 March 2019 (event stores). These events are detailed in **Table 33** in Appendix B.

While most of these were singular events, some had multiple phases, for example, when a supermarket opened or closed for a short period of time. In such circumstances we study the two events centred at the same location simultaneously, examining the before, during and after phases of the event.

We sought to assess the impact of entry, exit and rebranding on prices by looking at the prices of neighbouring Supermarkets for the twelve months prior to entry/exit/rebranding and the twelve months following entry/exit/rebranding. Because the events were spread over three financial years, from FY2017 to FY2019, we required five years of pricing data for the competitor stores.

For each event store, we identified the closest competitor stores in the following way, where Foodstufffs_ex_4SQ stands for all Foodstuffs banners except Four Square:

1. We classified stores into two groups: Woolworths NZ and Foodstufffs_ex_4SQ
2. We identified the closest competitors for each Woolworths NZ event store as the closest Foodstufffs_ex_4SQ
3. We identified the closest competitors for each Foodstufffs_ex_4SQ event store as: (i) the closest Foodstufffs_ex_4SQ; and (ii) the closest Woolworths NZ
4. For the two Farro Fresh openings we took the closest competitors as: (i) the closest Foodstufffs_ex_4SQ; and (ii) the closest Woolworths NZ
5. We discarded any of the competitors identified in the above steps if they were more than 10 kilometres away from the event store.
6. These steps yielded 47 competitor stores.

We sought to investigate the effect of the event on the prices of the closest competitor stores.[39] We confined our analysis to the closest competitor stores because the cross-section study had suggested that this was where we were likely to find the largest effects.

In order to analyse the effects on the prices of the closest competitor stores, we required information on the prices of goods sold in these stores for the relevant period. We asked the Commerce Commission to provide, for each of the 47 competitor stores, data on the number of units sold and the revenue received for each product sold, and for each week in the relevant period. The relevant period is 1 April 2015 to 31 March 2020. If data were not available for the whole of the relevant period, we sought the data for as many weeks in the relevant period as were available.

As in the cross-section study, we cleaned the data, removing from the sample products with barcodes fewer than 13 digits, eliminating fresh fruit and vegetables, gift/recharge cards and flowers. We also restricted attention to products other than those in the alcohol and tobacco departments.

Prices of the competitor stores may have changed around the time of the event for reasons other than the event – for example, because of general inflation. We used the prices of some of the 47 stores that were not neighbours of the event store to control for these and other causes of changes in prices of the competitor stores. Specifically, we identified as potential control stores any stores that:

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[39]   It was not possible to conduct this analysis on margins. Even if we could have been confident of the COGS data (see the first study) we could not have obtained useful COGS data relating to the week in which the relevant product was sold.

- belonged to the same group/Island as the closest competitor store,[40] and

- were at least 15 minutes' drive time from both the competitor store and the event store.[41]

This enabled us to identify stores that face similar price/cost drivers as the competitor store, yet are not impacted by the event, either directly, or indirectly through any impact of the event on the competitor store. For each competitor store, we used as control stores the four closest stores that satisfied the above criteria.[42] For many competitors, there were fewer than four valid control stores.

4.2   Approach to regression analysis

Data used

To examine the impact of the events on competitor stores, we first removed outliers in a manner similar to our procedure in the cross-section analysis.

Using data from all of the 47 competitor stores, we calculated the median price for each week, for each product (defined as the barcode), for each banner. We then calculated the absolute percentage difference between each observed price and the median price for the same week/product/banner. Finally, we classified as outliers the 2% of prices that were furthest from their respective medians across all weeks/products/banners. This resulted in our treating as an outlier any price that was more than 28.6% away from its median.

As in the cross-section analysis, we also classified any price of less than 1 cent as an outlier; and we omitted all outliers from the dataset used in the regression analysis.

Model specification

For each competitor store, we estimated a fixed effects regression model with log price as the dependent variable. The estimation dataset consisted of the log prices of each product and for each week of the analysis period, for the competitor store and up to four control stores. The dataset also included appropriate indicator variables.[43] Algebraically, the model we estimated can be written as:

$$\log price_{ijk} = aPost_{jk} + b_j + c_k + d_i + \varepsilon_{ijk}$$

where j denotes the store, k denotes the week and i denotes the product (barcode).[44] The terms b_j, c_k and d_i represent fixed effects for each store, week and product, respectively.

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[40]   This allowed PAK'nSAVE stores to serve as controls for New World stores, and vice versa.

[41]   Defined as in the cross-section study as the average drive time according to Google Maps API. Our cross-section study had suggested that stores more than 15 minutes' drive time away were unlikely to be close competitors of any particular focal store.

[42]   Distance as the crow flies.

[43]   52 weeks before and after the event for single events, 52 weeks prior to the initial event, the weeks between the initial event and the final event, and 52 weeks after the final event. Where the available data did not cover the whole period, we used as much of the data as available.

[44]   We use robust standard errors, equivalent to clustering at the barcode level.

The variable of interest, $Post_{jk}$, is equal to 1 if the store j is the competitor store[45] and k is in the 52 weeks after the event.[46] The coefficient a for the dummy variable $Post_{jk}$ provides an estimate of the impact of the event on the prices in the competitor store.

4.3   Regression results

The coefficients and t-statistics on the key variable of interest, Post (and for the price impact during for multi-stage events, During) are presented in **Table 34**. The results in the table are presented in descending order of the Post coefficient, starting with the event with the largest positive impact (i.e. price increase) on the prices of the competitor store, down to the event with the largest negative impact. We note that estimated impacts of the events on competitor stores' prices range from a 1.21% increase to a 2.06% decrease. In **Figure 3**, **Figure 4** and **Figure 5** we show some selected impacts for illustration.[47] Theoretically, we would expect to see an exit event associated with a price increase, an entry associated with a price decrease, whereas the impact of a rebranding might depend on the specific brand change that occurred.

Due to the large sample sizes, t-values tend to be large, and are often highly statistically significant, even when the economic impact is very small. Hence, in our discussion, we only comment on the price impacts which are economically significant, which we define as price impacts of at least 0.5% up or down. There are two cases where the estimated price impact was a price increase of at least 0.5%, and seven cases where the estimated price impact was a price decrease of at least 0.5%. Other observations are:

- The two Farro Fresh openings have vastly different estimated impacts on their respective competitors. The Remuera opening is estimated to have led to [   ] higher prices at the nearest [   ] competitor [   ], but [   ] lower prices at the nearest [   ] competitor [   ]. By contrast, the Mt Eden opening is associated with [   ] lower prices at the nearest [   ] competitor [   ], and [   ] higher prices at the nearest [   ] competitor [   ]. This evidence makes it challenging to conclude that entry by a small store constrains pricing of a much larger store.[48]

- The impact of the [   ] replacement on the pricing at [   ] is positive and economically significant [   ]. However, this may reflect the expansion/renovation that occurred at [   ] at about the same time, rather than the impact of the event.

- The price reductions observed at [   ] following the closure of [   ] are substantial [   ], but the opposite of what would be predicted.

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[45]   The dataset used for each regression contains prices for the competitor store and the control stores.

[46]   For the multiple stage events we also including a term, $During_{jk}$, that captures the impact on the competitor store's prices for a week between the two events.

[47]   **Figure 3** through **Figure 5** present results of an alternate regression specification, introducing a variable capturing the week effect interacted with whether the store is the competitor store or not, and omitting the Post and During variables. The coefficients of the above interaction terms are plotted along with the 95% confidence interval.

[48]   NW Alberton was 7 minutes' drive time from Farro Fresh Mt Eden, NW Eastridge was 5 minutes from Farro Fresh Remuera.

- The response of [   ] to the temporary opening of [   ] appears to show a price reduction following the entry of the supermarket of the competing banner [   ], and this effect is not reversed by the exit of [   ].

- The [   ] replacement store appears to have reduced prices at [   ], which would normally be somewhat unexpected, though it is possible the new store allows greater differentiation/segmentation of the market, while competing against Countdown banner stores.

- The entry of [   ] appears to have reduced prices at [   ] by [   ].

- The entry of [   ] appears to have reduced prices at the nearby [   ] by [   ]. We note that this particular supermarket was one of the highest priced [   ] supermarkets in NZ.

- Finally, the rebranding of [   ] from [   ] is associated with lower prices at [   ], reducing prices by [   ].

It should be noted that while many impacts were smaller than 0.5%, this should not be taken to mean no impact; in many cases an entry/exit may have little impact due to distances between stores. For example, while the opening of [   ] is associated with [   ] lower prices at nearby [   ], the impact appears to be cleanly identified in **Figure 5**.

4.4 Conclusions

The second study analysed the impact of the entry, exit or rebranded entry on the prices charged by close competitor stores. We used a sample of 32 events of entry, exit or rebranding. We found that most of these events had no economically-significant impact – where an economically-significant impact was defined as at least 0.5% up or down. Of the 9 cases with an economically-significant impact, two were positive (such as entry associated with a price increase) and seven were negative. The absolute magnitude of the impact of every event on the prices of the close competitor stores was less than 2.25%.

A   Cross section regression results

Table 16 through **Table 32** below present regression results for the selected regression specifications as described in Section 3.7 and Section 3.8. Note that not all area types are present in some samples. For all Supermarkets the income, population and age variables are divided by 100,000. The six banner Proximity variables are equal to 1 if the closest competitor of the selected banner is 0s away from the focal Supermarket, decreasing to 0 at the selected radius for 'Proximity' in **Table 13** above. Of the competitor proximity specifications, we only present the preferred specification controlling for only six major banner competitors as discussed in Section 3.5.

Table 16: [   ] cross section results (full sample)

	log price	log price
Share	0.0149***	
ProxNewWorld		0.0161***
ProxFourSquare		-0.00202
ProxPAK'nSAVE		0.00611*
ProxCountDown		-0.000543
ProxFreshChoice		-0.00308
ProxSuperValue		-0.000430
logarea	-0.00663***	-0.00710***
Major urban	-0.00530**	-0.00336
Large urban	0	0
Medium urban	0.00331	0.00499**
Small urban	0.00122	0.00649**
Income	0.0120	0.0205
Age	-7.244	7.667
Population	0.00840***	0.00543
Maori	-0.00170	0.00620
Foreign	-0.0123	-0.00711
Graduate	0.0489***	0.0435***
Constant	-0.00897	-0.00889
N	144	144
BIC	-957.7	-943.0

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

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Table 17: [   ] cross section results (full sample)

	log price	log price
Share	0.0304*	
ProxNewWorld		0.00484
ProxFourSquare		0.0102
ProxPAK'nSAVE		n/a
ProxCountDown		-0.00141
ProxFreshChoice		0.00643
ProxSuperValue		0.0130
logarea	-0.00928**	-0.00760*
Major urban	0.000360	0.00183
Large urban	0	0
Medium urban	0.00703*	0.00791
Small urban	-0.000261	0.00772
Rural other	0.0200**	0.0211***
Income	-0.0641	-0.0394
Age	-214.1***	-166.2***
Population	-0.00230	-0.00338*
Maori	-0.0403**	-0.0252
Foreign	-0.0485***	-0.0290
Graduate	-0.0121	-0.0184
Constant	0.174***	0.144***
N	56	56
BIC	-334.0	-321.9

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

*Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively*

Table 18: [   ] cross section results (full sample)

	log price	log price
Share	0.0166**	
ProxNewWorld		0.00544
ProxFourSquare		0.00484
ProxPAK'nSAVE		0.0225***
ProxCountDown		-0.00467
ProxFreshChoice		-0.0273***
ProxSuperValue		-0.0168**
logarea	-0.0250***	-0.0206***
Major urban	-0.0168**	-0.00597
Large urban	0	0
Medium urban	0.00175	0.00613
Small urban	-0.00907*	0.000871
Rural settlement	-0.0133**	-0.000164
Rural other	-0.0199**	-0.00787
Income	-0.00775	-0.00274
Age	-34.95	-35.40
Population	0.00794*	0.00356
Maori	-0.00341	-0.000796
Foreign	-0.0776***	-0.0649*
Graduate	0.130***	0.104**
Constant	0.111**	0.0875*
N	231	231
BIC	-1009.1	-998.8

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

*Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively*

Table 19: [   ] cross section results (full sample)

	log price	log price
Share	0.00971	
ProxNewWorld		-0.0101***
ProxFourSquare		-0.00187
ProxPAK'nSAVE		-0.00166
ProxCountDown		-0.00463**
ProxFreshChoice		-0.00630
ProxSuperValue		0.000459
logarea	-0.00174	-0.00128
Major urban	-0.00299	-0.00421*
Large urban	0	0
Medium urban	0.000750	-0.000971
Small urban	-0.00550*	-0.00961*
Income	0.0155	-0.0117
Age	-7.484	-8.376
Population	-0.0332***	-0.0158
Maori	0.0174**	0.0104
Foreign	0.0320***	0.0344**
Graduate	0.0236**	0.0344**
Constant	-0.00945	0.0114
N	181	181
BIC	-1175.3	-1158.8

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

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Table 20: [   ] cross section results (full sample)

	log price	log price
Share	0.0149*	
ProxNewWorld		-0.0183***
ProxFourSquare		0.00224
ProxPAK'nSAVE		0.00734
ProxCountDown		0.0000632
ProxFreshChoice		0.0694*
ProxSuperValue		n/a
logarea	-0.000974	-0.00358
Major urban	-0.0107*	-0.00643
Large urban	0	0
Medium urban	-0.00331	-0.00484
Small urban	-0.00807	-0.00707
Income	0.0286	-0.00725
Age	24.02	5.268
Population	0.0122**	-0.0447
Maori	0.0138	0.0136
Foreign	0.00218	0.0272
Graduate	0.0357	0.0222
Constant	-0.0227	0.0258
N	31	31
BIC	-194.1	-188.2

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 21: [   ] cross section results (full sample)

	log price	log price
Share	0.0318***	
ProxNewWorld		-0.0360***
ProxFourSquare		-0.00108
ProxPAK'nSAVE		-0.0224**
ProxCountDown		0.0270**
ProxFreshChoice		n/a
ProxSuperValue		0.0684**
logarea	-0.00727**	-0.00772**
Major urban	0.00436	0.00386
Large urban	0	0
Medium urban	0.0113*	0.0125***
Small urban	-0.00502	0.00394
Rural settlement	-0.00532	0.0132
Rural other	0.0152*	0.00578
Income	0.137**	0.124**
Age	46.70	112.1**
Population	-0.0000744	0.000935
Maori	0.0424**	0.0789***
Foreign	0.0235	0.0509*
Graduate	-0.0616**	-0.0337
Constant	-0.0592	-0.0837*
N	41	41
BIC	-236.7	-242.0

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

*Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively*

Table 22: [   ] cross section results (urban sample)

	log price	log price
Share	0.0284***	
ProxNewWorld		0.0167**
ProxFourSquare		-0.00541
ProxPAK'nSAVE		0.00705*
ProxCountDown		0.00114
ProxFreshChoice		-0.00443
ProxSuperValue		-0.0000807
logarea	-0.00733***	-0.00700**
Major urban	-0.00533**	-0.00438*
Large urban	0	0
Medium urban	0.00320	0.00477*
Income	0.0117	0.00163
Age	-24.55	-30.46*
Population	0.00955***	0.00159
Maori	-0.0181	-0.0125
Foreign	-0.0190*	-0.00136
Graduate	0.0418***	0.0398***
Constant	0.000849	0.0166
N	99	99
BIC	-636.6	-621.7

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 23: [   ] cross section results (urban sample)

	log price	log price
Share	0.0221	
ProxNewWorld		0.00386
ProxFourSquare		0.0102
ProxPAK'nSAVE		n/a
ProxCountDown		0.00144
ProxFreshChoice		0.00671
ProxSuperValue		0.00758
logarea	-0.00987**	-0.00873*
Major urban	0.0000160	0.00165
Large urban	0	0
Medium urban	0.00663*	0.00734
Income	-0.0467	-0.0235
Age	-222.5***	-192.9***
Population	-0.00242	-0.00314
Maori	-0.0449**	-0.0418**
Foreign	-0.0529***	-0.0437*
Graduate	-0.0199	-0.0236
Constant	0.186***	0.167***
N	52	52
BIC	-312.7	-298.8

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 24: [   ] cross section results (urban sample)

	log price	log price
Share	0.0967***	
ProxNewWorld		0.0180
ProxFourSquare		0.0369*
ProxPAK'nSAVE		0.0172
ProxCountDown		-0.0334
ProxFreshChoice		-0.0169
ProxSuperValue		-0.00124
logarea	-0.0272***	-0.0279***
Major urban	-0.0170*	-0.0135
Large urban	0	0
Medium urban	-0.0117	-0.00637
Income	0.0294	-0.0880
Age	116.1	156.0
Population	0.00368	0.000940
Maori	-0.0119	-0.00793
Foreign	-0.0510	0.0424
Graduate	0.149*	0.155*
Constant	-0.00230	0.0414
N	93	93
BIC	-370.0	-353.4

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 25: [   ] cross section results (urban sample)

	log price	log price
Share	0.000623	
ProxNewWorld		-0.00709**
ProxFourSquare		0.00296
ProxPAK'nSAVE		0.00327
ProxCountDown		-0.00668***
ProxFreshChoice		0.000997
ProxSuperValue		0.0124
logarea	-0.00265	-0.00276
Major urban	-0.00297	-0.00443**
Large urban	0	0
Medium urban	0.00180	0.00191
Income	-0.00933	-0.0128
Age	-32.96	-25.06
Population	-0.0111**	-0.0116*
Maori	0.0315***	0.0257***
Foreign	0.0368***	0.0377**
Graduate	0.0452***	0.0496**
Constant	0.0114	0.0126
N	153	153
BIC	-976.6	-963.0

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

*Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively*

Table 26: [   ] cross section results (urban sample)

	log price	log price
Share	-0.0186*	
ProxNewWorld		0.00677
ProxFourSquare		0.00603
ProxPAK'nSAVE		-0.00510
ProxCountDown		-0.00731
ProxFreshChoice		0.0356**
ProxSuperValue		0.0224**
logarea	-0.00784**	-0.00759*
Major urban	-0.0137***	0.00149
Large urban	0	0
Medium urban	-0.00982*	0.0104**
Income	0.0706	-0.120**
Age	106.3*	246.0**
Population	0.00350***	-0.0527*
Maori	-0.0141	0.0597*
Foreign	0.00219	0.0502**
Graduate	0.0248	0.00949
Constant	0.00790	-0.0307
N	19	19
BIC	-125.5	-159.1

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 27: [   ] cross section results (urban sample)

	log price	log price
Share	-0.0612*	
ProxNewWorld		-0.0241
ProxFourSquare		-0.00146
ProxPAK'nSAVE		-0.0225*
ProxCountDown		0.0188
ProxFreshChoice		n/a
ProxSuperValue		0.0728*
logarea	-0.0157***	-0.0137***
Major urban	0.00209	0.0000393
Large urban	0	0
Medium urban	0.00693	0.00819
Income	0.215	0.187
Age	259.9*	229.5
Population	0.00647	0.0102
Maori	0.0769*	0.105
Foreign	0.0918*	0.0712
Graduate	-0.0983	-0.0860
Constant	-0.0907	-0.115
N	22	22
BIC	-125.5	-127.9

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 28: [   ] cross section results (rural sample)

	log price	log price
Share	0.00119	
ProxNewWorld		0.00438
ProxFourSquare		0.00343
ProxPAK'nSAVE		n/a
ProxCountDown		0.00131
ProxFreshChoice		-0.00125
ProxSuperValue		0.00128
logarea	-0.00756***	-0.00891**
Small urban	0	0
Income	0.0660**	0.0759
Age	44.58*	50.73
Population	-0.106	-0.0829
Maori	0.0198**	0.0196
Foreign	0.0148	0.0116
Graduate	0.0357	0.0308
Constant	-0.0305	-0.0255
N	45	45
BIC	-321.7	-310.9

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 29: [   ] cross section results (rural sample)

	log price	log price
Share	0.00934	
ProxNewWorld		0.00871
ProxFourSquare		0.00473
ProxPAK'nSAVE		0.0243**
ProxCountDown		0.00613
ProxFreshChoice		-0.0210
ProxSuperValue		-0.0199**
logarea	-0.0190***	-0.0133***
Small urban	0.00931	0.00166
Rural settlement	0.00609	-0.000642
Rural other	0	0
Income	-0.0785	-0.0336
Age	-76.60*	-60.07
Population	0.00650	-0.141
Maori	-0.0102	0.00137
Foreign	-0.0707*	-0.0467
Graduate	0.0971*	0.0549
Constant	0.108**	0.0718
N	138	138
BIC	-644.6	-629.4

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 30: [   ] cross section results (rural sample)

	log price	log price
Share	0.0174***	
ProxNewWorld		-0.0101**
ProxFourSquare		-0.00113
ProxPAK'nSAVE		0.00979
ProxCountDown		n/a
ProxFreshChoice		n/a
ProxSuperValue		n/a
logarea	-0.000842	0.00119
Small urban	0	0
Income	0.0182	0.0277
Age	14.29	7.112
Population	0.0626	-0.0683
Maori	0.000454	-0.00208
Foreign	0.0150	0.0255
Graduate	0.0338	0.0291
Constant	-0.0359*	-0.0277
N	28	28
BIC	-212.0	-206.4

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 31: [   ] cross section results (rural sample)

	log price
Share	0.0282***
logarea	0.0130*
Small urban	0
Income	0.0302
Age	-32.90
Population	0.0648***
Maori	0.0229
Foreign	0.0422
Graduate	-0.112*
Constant	-0.102*
N	12
BIC	-74.77

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively

Table 32: [   ] cross section results (rural sample)

	log price	log price
Share	0.0339***	
ProxNewWorld		-0.0312
ProxFourSquare		-0.00407
ProxPAK'nSAVE		-0.723
ProxCountDown		-0.722
ProxFreshChoice		-0.00251
ProxSuperValue		n/a
logarea	0.00142	0.0114
Small urban	-0.0230***	0.00781
Rural settlement	-0.0289***	0.0171
Rural other	0	0
Income	0.111***	0.190*
Age	9.607	118.6
Population	-0.170***	-0.00173
Maori	0.0276*	0.0713
Foreign	0.133***	0.0666
Graduate	-0.0713**	-0.0281
Constant	-0.0761*	-0.223
N	19	19
BIC	-118.6	-120.8

Source: Frontier Economics analysis of data provided by the Commerce Commission, Google Maps data, HERE data

*Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively*

B Time series events and results

Table 33: Events studied

Event	WW Competitor	FS Competitor	Date 1	Date 2
PnS Levin rebranding from WP	Levin Countdown	NW Levin	May-17	
PnS Clendon rebranding from NW	Manurewa Countdown	NW Southmall	Apr-17	
PnS Tamatea replacement	Carlyle Countdown	NW Onekawa	Nov-16	
PnS Tauriko opening	Greerton Countdown	NW Gate Pa	Sep-16	
NW Feilding moving/WP Feilding closing	Feilding Countdown		Mar-18	May-18
NW Island Bay opening	Kilbirnie Countdown	NW Newtown	Aug-17	
NW Milford replacement	Milford Countdown	NW Metro Shore City	May-16	
NW Papakura replacement	Papakura Countdown	PnS Papakura	Dec-16	
NW Papatoetoe replacement	Papatoetoe Countdown	PnS Manukau	Mar-19	
NW Alberton rebranding from 4S	St Lukes Countdown	PnS Mt Albert	Aug-17	
NW Constellation temp opening	Sunnynook Countdown	NW Albany	Jun-17	Jul-18
NW Ferry Road opening	Ferrymead Countdown	NW St Martins	Oct-16	
NW Prestons opening	Northwood Countdown	NW Northwood	Feb-18	
PnS Queenstown opening	Queenstown CD	Wakatipu Combined	Nov-16	

Event	WW Competitor	FS Competitor	Date 1	Date 2
CD Glenfield consolidation		PnS Wairau Road	Jan-17	Jul-17
CD Mosgiel replacement		NW Mosgiel	Feb-17	
CD Redwoodtown replacement		NW Blenheim	Apr-16	Sep-17
CD Aotea opening		NW Whitby	Jan-17	
CD Ponsonby opening		NW Victoria Park	Jun-16	
CD Fairy Springs opening		NW Westend	Apr-16	
CD Cable Car Lane opening		NW Metro Willis Street	May-16	
CD Ashburton South opening		NW Ashburton	May-17	
CD Beachlands opening		NW Howick	May-17	
CD Bayfair consolidation		NW Mt Maunganui	Jan-18	Dec-18
CD Newmarket temp closure		NW Remuera	Jan-18	Nov-19
CD Waihi closing		NW Waihi	May-16	
CD Rangiora Central closing		NW Rangiora	Oct-16	
CD Westport closing		NW Westport	Apr-17	
CD Sylvia Park closing		PnS Sylvia Park	Apr-18	
CD Bush Inn closing		NW Ilam	Sep-18	
FF Remuera opening[49]	Meadowbank Countdown	NW Eastridge	Feb-17	
FF Mt Eden opening	Mt Eden Countdown	NW Alberton	May-18	]

Source: Frontier Economics analysis of data provided by the Commerce Commission

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[49] FF stands for Farro Fresh

Table 34: Time series regression results

Competitor store	Event	During coef	During t-stat	Post coef	Post t-stat
NW Eastridge	FF Remuera opening			[ ]	21.61
PnS Manukau	NW Papatoetoe replacement			[ ]	10.38
NW Blenheim	CD Redwoodtown replacement	[ ]	9.23	[ ]	11.40
NW Victoria Park	CD Ponsonby opening			[ ]	13.01
NW Onekawa	PnS Tamatea replacement			[ ]	8.20
NW Whitby	CD Aotea opening			[ ]	6.62
NW Waihi	CD Waihi closing			[ ]	7.75
NW Gate Pa	PnS Tauriko opening			[ ]	5.98
PnS Wairau Road	CD Glenfield consolidation	[ ]	-3.36	[ ]	1.90
NW Westport	CD Westport closing			[ ]	5.79
NW Ilam	CD Bush Inn closing			[ ]	6.64
NW Newtown	NW Island Bay opening			[ ]	3.91
Manurewa Countdown	PnS Clendon rebranding from NW			[ ]	4.24
NW Mt Maunganui	CD Bayfair consolidation	[ ]	-1.04	[ ]	2.68
NW St Martins	NW Ferry Road opening			[ ]	2.62
Mt Eden Countdown	FF Mt Eden opening			[ ]	2.57
NW Levin	PnS Levin rebranding from WP			[ ]	1.06
NW Rangiora	CD Rangiora Central closing			[ ]	0.91
NW Remuera	CD Newmarket temp closure	[ ]	0.26	[ ]	0.38
NW Mosgiel	CD Mosgiel replacement			[ ]	0.42
Papatoetoe Countdown	NW Papatoetoe replacement			[ ]	0.04
Feilding Countdown	NW Feilding moving/WP Feilding closing	[ ]	7.55	[ ]	-0.28
NW Southmall	PnS Clendon rebranding from NW			[ ]	-1.64
NW Westend	CD Fairy Springs opening			[ ]	-3.39
Kilbirnie Countdown	NW Island Bay opening			[ ]	-4.54

Competitor store	Event	During coef	During t-stat	Post coef	Post t-stat
Levin Countdown	PnS Levin rebranding from WP			[ ]	-4.79
St Lukes Countdown	NW Alberton rebranding from 4S			[ ]	-5.87
Northwood Countdown	NW Prestons opening			[ ]	-5.12
Wakatipu Combined	PnS Queenstown opening			[ ]	-4.67
NW Ashburton	CD Ashburton South opening			[ ]	-5.11
NW Howick	CD Beachlands opening			[ ]	-3.58
Meadowbank Countdown	FF Remuera opening			[ ]	-7.89
Ferrymead Countdown	NW Ferry Road opening			[ ]	-7.73
NW Northwood	NW Prestons opening			[ ]	-12.01
Papakura Countdown	NW Papakura replacement			[ ]	-11.45
Carlyle Countdown	PnS Tamatea replacement			[ ]	-12.63
Greerton Countdown	PnS Tauriko opening			[ ]	-8.90
Milford Countdown	NW Milford replacement			[ ]	-18.10
NW Albany	NW Constellation temp opening	[ ]	-6.90	[ ]	-9.02
PnS Sylvia Park	CD Sylvia Park closing			[ ]	-11.27
PnS Papakura	NW Papakura replacement			[ ]	-13.69
Queenstown CD	PnS Queenstown opening			[ ]	-25.83
NW Alberton	FF Mt Eden opening			[ ]	-8.88
NW Metro Willis Street	CD Cable Car Lane opening			[ ]	-13.94
PnS Mt Albert	NW Alberton rebranding from 4S			[ ]	-18.25
Sunnynook Countdown	NW Constellation temp opening	[ ]	-12.79	[ ]	-10.87

Source: Frontier Economics analysis of data provided by the Commerce Commission

Figure 3: [   ]

Source: Frontier Economics analysis of data provided by the Commerce Commission

Figure 4: [   ]

Source: Frontier Economics analysis of data provided by the Commerce Commission

Figure 5: [   ]

Source: Frontier Economics analysis of data provided by the Commerce Commission