New Zealand households and the 2008/09 recession

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This paper quantifies how the welfare of different types of household changed between 2006/07 and 2009/10; a period which included the 2008/09 recession. We use three measures of household welfare: income, expenditure and the EV metric. Using household-level data from the Household Economic Survey (HES), we allocate households into groups, first based on one dimension (e.g. age) and then clusters. The clusters, groups of households that are similar on a number of dimensions, lead to inferences beyond what is available from our one-dimensional groups. Households in low-income groups, with children and/or who rent were particularly impacted by the recession in terms of welfare losses owing to price changes. However, we find that those in low-income groups had strong increases in expenditure; furthermore, the welfare gains from this increased expenditure more than offset the welfare losses from the price changes.

Keywords: consumer; welfare; quantitative methods

1. Introduction

New Zealand went into recession in the first quarter of 2008 and did not grow in the six subsequent quarters. As a result, real Gross Domestic Product (GDP) was 3.8% lower in the June 2009 quarter than it was in the December 2007 quarter.\(^1\) The recovery has been slow. At the September 2011 quarter, real GDP had only just regained its December 2007 level. The aim of the paper is to highlight the heterogeneous welfare effects of this recession on different household types.

Recessions can affect households in many ways; these include falling asset values, rising unemployment and increased uncertainty. These phenomena affect different types of household with varying levels of severity. For example, older households have much of their wealth in assets (namely housing) and some, through downsizing to a smaller home, use this wealth to fund (the majority of) their retirement (Smith, 2007). Hence some older households are disproportionately affected by falls in asset prices relative to, say, young households, particularly renters. Increased unemployment in a recession may disproportionately affect younger cohorts. First, recessions make it harder to find a job upon initially entering the working-age population and, second, recessions may make it harder to find a job that utilises one’s skill set. For young people this means relevant skills become harder to acquire and/or skills gained elsewhere (e.g. in formal qualifications) depreciate. Finally, the increased uncertainty associated with a recession affects the behaviour of those less able to absorb shocks, perhaps those in debt and those with large fixed outflows (relative to income).

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The 2008/09 recession in New Zealand also coincides with some large price movements in goods and services. The varying weights of goods that rose and fell in price in different households’ expenditure bundles mean there are likely to be heterogeneous impacts on households’ welfare owing to these price changes.

This paper recognises the possibility there have been varying welfare changes for different household types over the recession and seeks to measure these changes using data from the Household Economic Survey (HES). This raises two issues: first, defining household ‘type’; and second, measuring the changes in welfare.

Section 2 discusses issues defining household type and measuring welfare. Section 3 outlines our preferred approach to forming household types, clustering and reports the household types created from applying this technique to the HES data. Section 4 reports how our first two measures of welfare, income and expenditure, changed during the recession by household types – both those created on the traditional basis and those created by the clustering process. Section 5 initially looks at how the welfare impacts of the different price changes varied across different household types depending on the composition of their budget. It then discusses what happens when the welfare changes from expenditure and price movements are aggregated to give a sense of the overall effect of the recession on welfare for our different household types. Section 6 concludes.

2. Measurement issues

2.1. Defining household types

Our first approach is to follow the traditional way of splitting households into types using one dimension, such as age groups or income quartiles. We call these ‘hard dimensions’. The term is designed to invoke the notion that the researcher sets an a-priori boundary when grouping the data under this approach. For example, in splitting the sample by age groups: 26–35, 36–45, etc., the researcher imposes an implicit assumption that there may be a difference between a 35-year old and a 36-year old, but none between a 34-year old and a 35-year old.

The hard dimensions we use to split the data are age, household ownership status, household structure, highest qualification and income quartile. Age refers to the age of the member of the household who earns the most; household ownership refers to whether the household is a renter, a mortgage holder (or owned outright) or ‘other’ (typically a trust-type arrangement). Qualification is a categorical variable, defined as whether the highest qualified person in the household has no tertiary qualification, a bachelors degree or a higher postgraduate degree. Household structure is defined by looking at the living status of the adults in the household – whether they are a couple, single or other, as well as whether there are children in the house. Finally, the household is also assigned to an income quartile, based on its household equivalised income.

The different dimensions in the data cannot be thought of as being statistically independent. For example, income and age are correlated, people who own their home rather than rent are likely to have higher incomes, and more qualified people generally have higher incomes. These relationships make identification of causality difficult. One possible solution is cross-tabulation, however, this presents a difficulty in small samples to ensure the statistical robustness of the results (and in some instances, comply with minimum sample confidentiality requirements). As the 2006/07 HES sample has around 2500 households, this is a problem in our case.
Our alternative approach to forming household types is ‘clustering’. The goal of clustering is to partition observations into homogeneous clusters based on a number of attributes, while observations in different clusters are heterogeneous on those attributes. Clustering allows small sample sizes to be split on more dimensions than cross-tabulation to help deal with identification issues, while maintaining confidentiality and statistically significant sample sizes. Further, the data determine the boundaries of a cluster. Using our example of age groups, clustering lets ‘the data decide’ where the boundary lies rather than imposing it between 35 and 36. Finally, clustering captures natural correlations in the data (age and income) which allow us to provide intuitive descriptions of the characteristics of a cluster.

2.2. Measuring welfare

The first two indicators of economic welfare we look at are household disposable income and the level and composition of expenditure. Examining how the recession has impacted on household expenditure is important for two reasons. First, slowing expenditure growth to help repair household balance sheets was a feature of the 2008/09 recession; therefore, the prospects for a recovery in household expenditure are central to the prospects for a recovery in the wider economy. Second, expenditure is connected to the living standards of individuals and households. Therefore, changes in household expenditure, as well as household income, are important indicators of the extent to which recessions have a detrimental impact on the living standards of households.

Our third measure of the change in welfare, equivalent variation (EV), relates to the impact of price changes. Between 2006/07 and 2009/10, some goods and services have experienced large price movements, such as petrol, household energy, food and rents (see Table 1). The increase in rents is particularly important when taken in conjunction with the fact that the effective mortgage rate fell from 7.98% to 6.85% in the period. This implies a shift in welfare from renters to mortgage holders.

Clearly, the exact measurement of how economic welfare for a household changed over the recession is contingent on the time period used to measure the changes. Our analysis requires detailed household expenditure breakdowns. The most recent edition of the HES, with expenditure data, ran from July 2009 to June 2010 (hereafter the 2009/10 HES). The previous edition to the 2009/10 HES with expenditure data ran from July 2006 to June 2007 (hereafter the 2006/07 HES).

Table 1. Percentage price changes over the period (growth in the average of Consumer Price Index subcomponent between June years 2006/07 and 2009/10).

| Expenditure group                              | Expenditure group                                    |
|------------------------------------------------|------------------------------------------------------|
| Food exc restaurants                           | Clothing                                             |
| Household energy                               | Household appliances                                  |
| Insurance                                      | Household textiles                                   |
| Cigarettes and tobacco                         | Footwear                                             |
| Petrol                                         | Telecommunication services                           |
| Major recreational and cultural equipment      | Furniture, furnishings and floor coverings           |
| Actual rentals for housing                      | International air transport                          |
| Accommodation services                         | Interest payments on personal loans                  |
| Purchase of vehicles                           | Domestic air transport                                |
| CPI All groups                                 |                                                       |

Source: Statistics New Zealand (consumer price index).
In HES information on expenditure is collected by a range of methods, including a 12-month recall of large products, information on latest payments for regular payments and a 14-day expenditure diary for adults. This means expenditure data in HES 2006/07 and HES 2009/10 mainly covers the periods from July 2006 to June 2007 and July 2009 to June 2010, respectively. In HES, participants are asked to recall income sourced in the previous 12 months, meaning income data covering the respective periods from July 2005 to June 2007 and July 2008 to June 2010. In a technical sense, the recession ended in Q2 2009. For this reason the expenditure data are our preferred measures of welfare as the June years 2007 and 2010 are as close to shouldering either side of the recession as one can get on a June year basis. Households early in the 2009/10 sample will recall some income made in the second half of 2008, before the recession ended, meaning the income data may understate the recession’s impact. More generally, this paper takes two snapshots in time as dictated by the data and sees how welfare has changed. The impacts of the recession have lasted longer than the June 2010 year, particularly in the labour market. Therefore, this paper does not measure the full impacts of the recession, rather the initial impacts as presented in the data to the 2009/10 June year.

3. Clusters

Clustering techniques are commonly employed in applied data analysis, particularly marketing. The popularity of the approach in marketing is linked closely to the idea of market segmentation – the attempt to distinguish homogeneous groups of consumers who can be targeted in the same manner because they have similar characteristics and preferences. Given we are trying to establish a number of groups with broadly similar characteristics and preferences, this approach is attractive to us.

Punj and Stewart (1983), reflecting on their meta-analysis of clustering studies, suggest the dimensions used in determining the clusters are critical. They also state that there needs to be a rationale for inclusion, on the basis of theory or hypothesis.

The first four dimensions we use are age of highest income earner, number of children, qualification and home ownership and household disposable income. These dimensions ensure that households have similar demographics, and therefore, their tastes and preferences are broadly similar. The level of disposable income is included not only for this reason but also as a measure of how well the household can absorb shocks. We also look at the proportion of income that comes from different sources: government transfers (excluding working for families); private and public pensions; investments and private sources (excluding private pension and investments). This gives us the ability to create clusters with varying sensitivity to different shocks (e.g. a financial/housing market shock will affect a cluster with a higher proportion of their income from investments). Second, the sources of income contain some demographic information, for example, we can distinguish between working and non-working older people by the percentage of their pension incomes relative to the percentage of wage and salary income.

For a given household, for each dimension \( d \) (e.g. age, income, etc.), we can create an index:

\[
x_d = w_d a_d,
\]

where \( w_d \) is the weight we assign to the importance of dimension \( d \) and (if the values that dimension can take are numeric) \( a_d \) is the observed value of that dimension for the given
household standardised to a value between 0 and 1 based on its percentile relative to all observed values of that variable in the data set.\textsuperscript{10}

For $1, 2, \ldots, d$ dimensions there is a vector:

$$X = (x_1, x_2, \ldots, x_d) = (w_1a_1, w_2a_2, \ldots, w_da_d)$$

that describes each household; there is also a vector $M_i$:

$$M_i = (m_{i1}, m_{i2}, \ldots, m_{id})$$

of the values of the index for each dimension $d$ at the centre of cluster $i$. Let

$$D(\Omega, M) = \sum_{X \in \Omega} d(X, M)$$

be the distance measure that describes the distance between each observation $X$ in the whole data set $\Omega$ and all the centres $M_i$, summed across all observations. We find the cluster centres that minimise the following distance measure:

$$D(\Omega, M) = \sum_{X \in \Omega} \left( \frac{K}{\sum_{i=1}^{K} \left\| X - M_i \right\|^2} \right),$$

where $K$ is the number clusters created (in our case 12). As can be seen with the inside summation over $i$, this measure considers the distance from every observation $X$ to the centre of each cluster $M_i$. The clusters were created by applying this algorithm (called $K$-harmonic means; see Zhang (2000) for more detail) to the 2006/07 HES data set. In order to track how these clusters have fared post recession, we then applied the centres (i.e. the final vector of dimensions for each cluster) to the 2009/10 data set.

For a more detailed exposition of the clustering methodology used, including information on the dimension weights and the methods used to select the number of clusters, as well as a technical discussion of the appropriateness of clustering for the HES data set, see Ball and Ryan (2013).

### 3.1. Cluster descriptions

This section outlines the 12 clusters created using the $K$-harmonic means. Tables 2 and 3 provide some information on the clusters’ income sources and demographic information (the reported numbers are arithmetic means for the cluster, except for the ‘mortgage holders’ and ‘single parents’ columns in Table 3 which are the percentage of the cluster that meet that criteria).

Clusters A and B are young low-income households. A receives a high proportion of income from transfers and receives higher than average unemployment benefit receipts.\textsuperscript{11} B has more children, more wage/salary income and lower benefit payments (outside those related to family assistance and the sickness benefit) than A. Consistent with B having the highest average number of children and a relatively low wage and salary income, B receives more from the family assistance benefit types (family tax credits and in-work tax credits) than any other cluster. Both A and B are generally renting and relative to other clusters have a high proportion of single-parent families (36% and 20%, respectively);
consistent with this they receive the highest average domestic purposes benefit payments. Consistent with these clusters being mainly renters, rents in their budget share are over-represented and mortgage payments under-represented relative to all clusters. In line with the fact that households in B have a relatively high number of children on average, they spend relatively more on food and petrol.

E, H and K are the older household clusters. Households in cluster K are generally either working New Zealand Superannuation recipients or nearing retirement, and have higher income and higher qualifications relative to the other older clusters and more diverse income streams (a higher proportion of their income is from investments). Households in cluster E are, on average, older than K, and appear to be fully retired, receiving over 80% of their income from pensions – the highest percentage of any cluster. Households in cluster H are, in a way, an intermediate cluster between K and H. They are of a similar average age to cluster E, but receive more income from wages/salary. This cluster may therefore be more likely to be doing some work (i.e. part time) in their retirement. E and H receive approximately the same equivalised disposable income, despite the fact that H has a higher disposable income. Looking into the data further reveals that about two-thirds of the households in cluster E are single-person households as opposed to 25% in cluster H, hence the larger adjustment of H’s disposable income when equivalised. Reflecting their relatively low income (as opposed to the other older cluster, K), E and H spend a higher proportion of their budget on the necessities of life: food and household energy.

Table 3 shows that between 67% and 80% of households in clusters E, K and H are mortgage holders (or have fully repaid a mortgage). Given their life stage this may seem low, but structuring of their affairs into a trust/company structure (which is classified as ‘other’ in HES) may be biasing down this result. Additionally, these older clusters have a low budget share of mortgage payments; this is consistent with their more advanced age giving them time to have paid their mortgage off.

There are two young highly qualified clusters C and G. Cluster G could be characterised as being a cluster of young well-paid professionals, with high equivalised disposable income reflecting their high salary and lack of children. Reflecting their high income,

Table 2. 2007 income sources.

| Cluster | Household disposable income ($) | Wage and salary ($) | Transfers (ex-WFF) | Investment income | Pension | Private sources$ |
|---------|--------------------------------|---------------------|--------------------|-------------------|--------|-----------------|
| A       | 17,436                         | 16,328              | 41                 | 0                 | 0      | 56              |
| B       | 20,146                         | 33,694              | 25                 | 1                 | 1      | 73              |
| C       | 22,057                         | 30,440              | 15                 | 11                | 0      | 72              |
| D       | 12,435                         | 7137                | 45                 | 4                 | 0      | 44              |
| E       | 17,239                         | 912                 | 6                  | 7                 | 82     | 5               |
| F       | 28,702                         | 35,397              | 4                  | 4                 | 0      | 92              |
| G       | 51,386                         | 92,755              | 2                  | 1                 | 0      | 97              |
| H       | 21,835                         | 4956                | 4                  | 11                | 72     | 13              |
| I       | 37,044                         | 70,514              | 2                  | 3                 | 0      | 95              |
| J       | 43,306                         | 69,709              | 2                  | 3                 | 0      | 96              |
| K       | 56,353                         | 38,048              | 2                  | 17                | 27     | 55              |
| L       | 65,599                         | 91,394              | 1                  | 6                 | 0      | 93              |

$Excluding investment and private pension income.
cluster G has a relatively low budget share of food and household energy. Households in cluster C, although similarly qualified as G, receive lower wage and salary income. This may reflect they are qualified in different areas than G, or have had trouble getting a well-paying job despite their qualifications.

There are two middle-aged mortgage holding clusters: I and J. Cluster I is more highly qualified, has higher average wage/salary, but has more children meaning their equivalised income is about the same as cluster J. Given households in both these clusters are generally mortgage holders, we see mortgage payments over-represented in their budget shares.

Members of L are mid-life highly qualified high earners. It possibly represents the later life stage of G and I. Consistent with their status as high-income earners, those in cluster L have high investment income, have a higher relative budget share on luxury items, such as international air travel, audiovisual and computing equipment and major cultural and recreational equipment, and a lower budget share on necessities. Households in cluster F are, on average, roughly the same age as L, slightly less qualified and on lower incomes. D is the mid-to-later life beneficiary cluster, with relatively large average payments of unemployment, invalid and sickness benefit and relatively low wage and salary income.

### 4. Household income and expenditure

As discussed in Section 2, the first two indicators we use to examine the welfare changes over the recession are household disposable income and expenditure on goods and services. Based on Statistics New Zealand (1996), we also allocate the expenditure categories from HES into durable or non-durable expenditure where possible. We are interested in changes over the recession in durable expenditure for three reasons. First, many durables are long-lived, therefore, it is possible to delay their replacement in the face of income or wealth loss. Second, the slowdown in the housing market means the so-called ‘housing furnishing’ channel will be slower. Third, some durables are likely to be funded by credit; Reserve Bank data showed at an aggregate level annual household debt growth was 1.0% in December 2011 compared to around 13% in 2007. Therefore, the 2008/09 recession may

| Cluster | Population (2006/07,000) | Population (2009/10,000) | Growth (%) | Age | Children | Average qualification score | Mortgage holders (%) | Single parent (%) |
|---------|--------------------------|--------------------------|------------|-----|----------|-----------------------------|---------------------|------------------|
| A       | 122                      | 156                      | 28         | 32  | 0.7      | 0.9                         | 9                   | 36               |
| B       | 105                      | 104                      | 0          | 36  | 2.9      | 1.7                         | 29                  | 20               |
| C       | 110                      | 132                      | 20         | 34  | 0.6      | 5.0                         | 22                  | 11               |
| D       | 104                      | 103                      | -2         | 59  | 0.1      | 1.5                         | 50                  | 9                |
| E       | 172                      | 172                      | 0          | 74  | 0.1      | 0.4                         | 67                  | 3                |
| F       | 124                      | 138                      | 11         | 52  | 0.2      | 3.0                         | 87                  | 10               |
| G       | 165                      | 159                      | -4         | 30  | 0.3      | 4.6                         | 39                  | 2                |
| H       | 108                      | 115                      | 7          | 72  | 0.1      | 3.4                         | 69                  | 3                |
| I       | 145                      | 138                      | -5         | 42  | 2.4      | 4.6                         | 72                  | 3                |
| J       | 183                      | 163                      | -11        | 44  | 0.7      | 1.3                         | 80                  | 4                |
| K       | 67                       | 87                       | 30         | 65  | 0.1      | 3.8                         | 80                  | 8                |
| L       | 165                      | 158                      | -4         | 52  | 0.2      | 5.3                         | 72                  | 4                |
have seen some households voluntarily deleverage and/or other households face an involuntary reduction in credit (owing to a tightening in bank lending and the collapse of small finance companies).

4.1. Results

We start with the results based on household types created by splitting the sample on hard dimensions. By contrasting our clustering results against the hard dimension results, we are able to point out the advantages of using the clustering technique. All values reported in the tables are the weighted (by population weights) arithmetic mean values for the relevant group within each category.

4.1.1. Hard dimension results: income and expenditure

Looking at the split by age group in Table 4, there is relatively stagnant growth in disposable income in the youngest age group (less than general consumer price index inflation) compared with the older working-age groups. This may owe to slow growth or falls in employment in the younger age groups during the recession. Between the June years 2006/07 and 2009/10, employment in the under 25 category fell by 10% according to the Household Labour Force Survey (HLFS), significantly more than other age cohorts. The HLFS also shows that the two older age groups, 55–64 and 65+, experienced the strongest employment growth, which is consistent with our finding that the two older age groups had the strongest disposable income growth.

Comparing the four income quartiles (see Table 4), the marginally stronger household disposable income growth in the lower quartile may reflect employment income growth and/or the increase in transfers (mainly around family assistance) to lower income deciles over the period. Growth in expenditure between the two periods was higher in the lower three equivalised income quartiles. At least for the lower two income quartiles this could reflect an increase in the price of non-durable necessities: there was an increase in the budget share of non-durables of 1.0 and 1.7 percentage points for quartile 1 and 2, respectively. Given that the non-durable necessities that increased in price relatively (e.g. food) are likely to be a higher proportion of expenditure of those on lower income and, given these goods are relatively inelastic, we would expect total expenditure to increase for these income quartiles when non-durable necessity prices increase.

The family structure results also appear to reflect the growth in family assistance. The two categories with children that have the lowest average income, ‘single, with children’ and ‘other, with children’, experienced the strongest disposable income growth. Another striking result is the large increase in the non-durables budget share of the ‘other, with no children’ (up 4%). This household type spends a large share of its budget on alcohol and restaurant/takeaway food, both of which increased in price. Their slow income and therefore expenditure growth has meant this age group may have been forced to trade off non-durables for durables as prices increased. This contrasts with the ‘other, with children’ group, whose relatively strong disposable income growth has allowed them to increase their expenditure in the face of price increases of necessities meaning as a consequence the budget share of non-durables has had to increase by less.

Table 4 shows there was stronger disposable income growth in the more qualified categories. This picture is consistent with full-time equivalent (FTE) employment growth
Table 4. Expenditure and income by age, equivalised income quartile, family type and qualification.

| Age group       | Expenditure 2006/07 ($) | Expenditure 2009/10 ($) | Expenditure growth (%) | Disposable Income 2006/07 ($) | Disposable Income 2009/10 ($) | Disposable income growth (%) | Δ Non-durables budget share (%) |
|-----------------|-------------------------|-------------------------|------------------------|-----------------------------|-----------------------------|------------------------------|-------------------------------|
| < 25            | 47,003                  | 48,752                  | 4                      | 57,171                      | 58,025                      | 1                            | 2.5                           |
| 25–34           | 53,976                  | 54,778                  | 1                      | 58,454                      | 66,187                      | 13                           | 2.2                           |
| 35–44           | 57,175                  | 57,573                  | 1                      | 56,591                      | 63,922                      | 13                           | 0.7                           |
| 45–54           | 60,256                  | 66,708                  | 11                     | 70,658                      | 77,266                      | 9                            | 0.9                           |
| 55–64           | 47,093                  | 56,652                  | 20                     | 52,758                      | 71,150                      | 35                           | -1.0                          |
| 65+             | 29,300                  | 32,050                  | 9                      | 31,726                      | 41,871                      | 32                           | 1.9                           |
| 1               | 24,686                  | 28,004                  | 13                     | 17,942                      | 22,185                      | 24                           | 1.0                           |
| 2               | 40,551                  | 44,125                  | 9                      | 37,563                      | 45,094                      | 20                           | 1.7                           |
| 3               | 53,371                  | 58,246                  | 9                      | 56,030                      | 65,893                      | 18                           | 0.5                           |
| 4               | 77,158                  | 81,323                  | 5                      | 101,477                     | 119,285                     | 18                           | 0.8                           |
| Single, no children | 26,655              | 29,177                  | 9                      | 28,904                      | 34,362                      | 19                           | 0.8                           |
| Single, children | 34,530                | 36,522                  | 6                      | 31,653                      | 39,061                      | 23                           | -0.5                          |
| Couple, no children | 54,274                | 59,710                  | 10                     | 61,807                      | 75,620                      | 22                           | 1.2                           |
| Couple, children | 64,187                | 69,067                  | 8                      | 65,244                      | 73,410                      | 13                           | 0.9                           |
| Other, no children | 64,026                | 61,721                  | -4                     | 78,657                      | 81,517                      | 4                            | 4.0                           |
| Other, children | 51,053                 | 63,412                  | 24                     | 62,898                      | 77,934                      | 24                           | 1.0                           |
| School or none  | 41,943                  | 45,792                  | 9                      | 45,910                      | 53,454                      | 16                           | 1.4                           |
| Bachelor degree | 68,923                  | 69,359                  | 1                      | 70,482                      | 88,139                      | 25                           | 0.8                           |
| Postgraduate    | 70,071                  | 75,656                  | 8                      | 76,599                      | 91,786                      | 20                           | -0.4                          |
and earnings growth by industry as reported in the Quarterly Employment Survey.
Industries that may be considered to have more highly qualified people, such as pro-
fessional, scientific, technical and support services (11% earnings growth, 12% employee
growth); public administration, education and training (12% earnings growth, 7%
employee growth) and health care and social assistance (17% earnings growth, 7%
employee growth), all grew more strongly over the period between June 2010 and June
2008 than the economy-wide averages of 12% earnings growth and a 1% fall in FTE
employees.

4.1.2. Hard dimension results: durables expenditure

The fall in durables expenditure as a proportion of total expenditure was larger for non-
renters (Table 5). This fall could be consistent with any of the theories we put forward
regarding how the recession could have impacted on durable expenditure. First, home-
owners are more likely to buy durable products for their new houses, therefore, the slow-
down in the turnover in the housing stock may have slowed durables purchases. Second,
homeowners are likely to have higher initial levels of debt in the form of mortgages, so
either they have experienced a voluntary or involuntary slowdown in debt growth, and
debt is primarily used to purchase durables. Third, the fall in wealth owing to falling
house prices could reduce or delay discretionary spending, some of which is likely to be
durable.

Table 5 shows durable expenditure has fallen the most as a percentage of their budget
share for the two middle-aged age groups: 35–44 and 45–54, and people in the older
(65+) age group. Smith (2007) reports older households have relatively low levels of
mortgage debt but high home ownership, and are more likely to trade down into cheaper
housing and spend the equity. The relatively large fall in durables in the budget share in
the older age group may reflect less churn in the market making downsizing harder, and
therefore, older households not being either able to release equity in their house to fund

| Table 5. Durable expenditure by hard dimension. |
|------------------------------------------------|
|                                                |
| | Durable budget share | | Change in budget share of | |
| | 2006/07 (%) | Total | Non-housing | Housing |
| | | durables (%) | durables (%) | durables (%) | |
|------------------------------------------------|
| Home ownership | Renters | 9 | -1.4 | -0.1 | -1.3 |
| | Mortgage holders | 11 | -2.3 | -0.1 | -2.2 |
| | Other | 15 | -3.5 | -0.7 | -2.8 |
| Age | &lt; 25 | 8 | -0.2 | 1.5 | -1.7 |
| | 25–34 | 9 | -1.2 | -0.2 | -1.0 |
| | 35–44 | 13 | -3.2 | -0.8 | -2.4 |
| | 45–54 | 12 | -2.9 | -0.8 | -2.1 |
| | 55–64 | 11 | -0.9 | 1.1 | -2.0 |
| | 65+ | 12 | -2.9 | -0.4 | -2.5 |
| Equivalised income quartile | YD1 | 8 | -1.7 | 0.0 | -1.8 |
| | YD2 | 11 | -2.0 | 0.3 | -2.3 |
| | YD3 | 12 | -3.0 | -1.0 | -2.0 |
| | YD4 | 12 | -2.1 | 0.0 | -2.0 |

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their spending or alternatively, having less demand for new durables (through the ‘housing furnishing’ channel) as they stay in their existing house. In terms of these competing explanations, it is interesting to note that for the 65+ age group average expenditure and income were similar in the 2006/07 year but average expenditure was significantly less than income in the 2009/10 year. This may indicate that nervousness about being able to access their housing equity meant older households are starting to save more (or are less willing to run down savings).

Identifying the cause of the large fall in budget shares of durables of the 35–55 age group is more difficult. They are the age group more likely to be trading up in terms of housing, therefore, the fall in durables may reflect less churn in the housing market slowing the housing furnishing channel. Alternatively, this age group is likely to have a lot of debt in the form of mortgages (in 2009/10, they spent 7.2% of their income on mortgage payments, 1.0 percentage point more than the next highest age group), therefore, they may have been more precautionary in light of this, especially in the presence of house price falls decreasing their ratio of assets to debt. Consistent with the final explanation, Smith (2007), using HES data, found for this age group that even non-housing expenditure growth is more correlated with the average house price than other age groups. We also find this, with Table 5 showing that those in the 35–44 and 45–54 age groups had the largest fall in budget share of non-housing-related durables.

Looking at the split by income quartiles supports the hypothesis that housing market gearing may be having a role in reducing durables expenditure for the middle-aged groups. Kida (2009) found that higher income households tended to be more highly geared, with the third to fifth quintiles having the highest ratios of outstanding mortgage debt to home value, with the fourth quintile being the most highly geared. Kida (2009) suggests that this makes them the most exposed to falling house prices. Given the biggest drop in durables was in quartile 3 (followed by 4 and 2), and given the fourth quintile would most likely be in our third quartile, this may (and we emphasise may as this analysis is indicative only) mean that these households have voluntarily reduced their debt, and therefore, durable expenditure in light of this vulnerability. The earnings cycle means that those in the 35–55 age are more likely to be in the upper income quartiles, which may explain why this age group has seen a large drop in durables in their budget share.

We caution that the falls in durables should not be taken as estimates of the impact of housing debt on different households, or even a formal test of their presence. Differences we observe across home ownership status, income quartiles and age groups could be owing to reasons other than precaution in the face of gearing: other plausible explanations include different shocks to other income sources (e.g. employment) or wealth effects from other non-housing assets.

4.1.3. Cluster results

Table 3 presented the population count for each cluster in both 2006/07 and 2009/10. The following results stand out: the number of households in cluster K, the working older cluster, has shown significant growth (30%) between 2006/07 and 2009/10, reflecting the strong growth in employment in the 60+ age groups. Whilst acknowledging the sampling issues with older age groups in HLFS, between June quarter 2008 and June quarter 2010, employment in the 60–64 and 65+ age groups grew 23% and 27%, respectively (the corresponding population growth in those age groups was 11% and 8% over the same time
period); E, the predominately ‘retired’ cluster, held about constant in numbers of households, whilst the cluster H, retirees with some wage income grew 7% – a direction consistent with employment in the 65+ age group in the HLFS.

Two of the three predominately renting younger clusters (A and C) also grew strongly, at the expense of I and J – the predominately young mortgage holding clusters. This perhaps indicates either that the tightening of lending standards by banks during the recession has impacted on the ability of younger households to get into the housing market, or alternatively, there has been a reluctance on the behalf of younger households to take on mortgage debt to buy a house. Another interesting result is the growth of C, but the decline in G. Remember that households in C and G were on average similarly aged and qualified but had different incomes. The decline in membership of cluster G at the expense of C may reflect the recession has made it harder for new graduates to find well-paying jobs and hence more are in the lower income cluster.

In addition to being the fastest-growing cluster, Table 6 shows that amongst the clusters, the second strongest average income growth was recorded by cluster K (33%); again this, and the 22% income growth of cluster H (retirees with some wage income), most probably reflects the strong increase in older age employment referred to earlier. Disposable income growth was 18% for the other older cluster E; this illustrates the advantage of our approach. The outcomes over the recession for older households were different depending on whether they were more likely to be working and this inference would be missed if one had just examined the hard dimension result of 32% income growth in the over 65-year age group.

The other two clusters that experienced relatively strong disposable income growth were A and D, both dependent on government transfers and the minimum wage, which as we mentioned increased during the period. Another interesting point is for three out of four of the lowest income clusters A, C and D, their expenditure outweighs their disposable income in both years (see Table 6), but, over the period income growth was stronger than expenditure growth meaning, all else equal, their level of dis-saving fell.

The reduction in budget share of durables is large for L, K, E and D, even after accounting for their large percentage of mortgage holders. L and K, respectively, received around $1700 and $1500 from housing investments in 2006/07, significantly higher than the next highest cluster I, which received $800. This means they are likely to be highly geared with respect to the housing market, and therefore, more sensitive to house price falls. D cut back on their durables expenditure significantly and also increased the share of their budget devoted to mortgage payments (with mortgage payments increasing 1.4 percentage points in this cluster’s budget share over the period despite the fall in the effective mortgage rate). This cluster is a low-income, low-qualified, mortgage holding cluster, therefore, their reduction in durables to possibly fund their increased mortgage payments to pay off debt faster may be more precautionary (especially given the relative performance of qualified versus non-qualified jobs over the period we discussed before). Cluster E (older non-workers) also reduced their budget share of durables by a lot relative to their percentage of mortgage holders – this may reflect a lower prevalence of active housing equity withdrawal (or alternatively a lack of access to credit for older age groups or less willingness to run down savings) meaning these households are either delaying or stopping discretionary spending on durable goods. This is opposed to the other older cluster H, which still, on average, has some wage income, and therefore, may not be so reliant on housing equity to support durable expenditure.
Table 6. Expenditure and income by cluster.

| Cluster | Expenditure 2006/07 | Expenditure 2009/10 | Expenditure growth (%) | Disposable income 2006/07 | Disposable income 2009/10 | Disposable growth (%) | Δ budget share of durables | Δ budget share of non-durables |
|---------|---------------------|---------------------|------------------------|--------------------------|--------------------------|-----------------------|--------------------------|-----------------------------|
| A       | 29,141              | 31,705              | 9                      | 24,712                   | 31,406                   | 27                    | −2.1                     | 1.5                         |
| B       | 40,162              | 46,838              | 17                     | 44,139                   | 50,826                   | 15                    | −3.4                     | 2.6                         |
| C       | 43,017              | 45,475              | 6                      | 32,301                   | 38,082                   | 18                    | −2.4                     | 1.1                         |
| D       | 21,823              | 25,934              | 19                     | 14,062                   | 19,109                   | 36                    | −4.5                     | 1.9                         |
| E       | 19,417              | 21,137              | 9                      | 20,230                   | 23,913                   | 18                    | −4.4                     | 2.4                         |
| F       | 43,690              | 47,574              | 9                      | 36,280                   | 43,932                   | 21                    | −1.1                     | 2.3                         |
| G       | 66,849              | 70,738              | 6                      | 82,616                   | 98,273                   | 19                    | −0.4                     | 1.4                         |
| H       | 33,844              | 34,487              | 2                      | 29,165                   | 35,641                   | 22                    | −2.2                     | 4.3                         |
| I       | 78,454              | 85,485              | 9                      | 78,259                   | 97,016                   | 24                    | −2.6                     | 2.2                         |
| J       | 59,606              | 68,085              | 14                     | 70,721                   | 83,381                   | 18                    | −3.1                     | 0.6                         |
| K       | 56,499              | 64,952              | 15                     | 81,565                   | 108,165                  | 33                    | −5.7                     | 2.6                         |
| L       | 80,961              | 83,541              | 3                      | 104,893                  | 116,815                  | 11                    | −4.2                     | −0.2                        |
5. The welfare effects of price changes

Sections 5.1–5.3 report the welfare effects of the price changes that occurred over the recession. Whilst not all price changes are directly attributable to the recession, in the period between 2006/07 and 2009/10, there were large price changes in expenditure categories that typically receive a large share of the household budget; namely, there were large increases in food and fuel prices, insurance, energy, local authority rates and rents, whilst there were falls in mortgage rates. The varying proportion of these goods in different households expenditure bundles will therefore generate different welfare changes amongst households.

In Subsection 5.4, we aggregate the welfare changes owing to both expenditure and price changes to examine the total welfare effects of the recession for the different household types.

5.1. EV as a measure of welfare

We follow the approach of Creedy (1998), who uses the linear expenditure system (LES) to derive the EV measure. This approach explicitly assumes preference heterogeneity between household types and clusters, and assumes households within the same group (where household types are split on hard dimensions) or the same cluster have the same preferences. This assumption motivated the first part of this paper: establishing household types that could be assumed to be internally homogeneous but heterogeneous from each other.\^[14] The technical details of the EV measure and how it is derived are available in Creedy and Sleeman (2006). The EV can be expressed in terms of the expenditure function \( E(p, U) \) as

\[
EV = E(p_1, U_1) - E(p_0, U_1),
\]

where \( p_0 \) and \( p_1 \) are the old and new prices, respectively, and \( U_1 \) is the new utility level post price changes. EV is the maximum amount the individual would be prepared to pay, in the presence of new prices, to return to the old prices and hence can be thought of as the welfare loss associated with price changes in the economy. We also normalise the EV by 2006/07 expenditure to examine the proportionate change in EV relative to total spending (hereafter EV/Exp) and get a sense of how progressive or regressive the welfare impact of the price changes are.

5.2. Results by hard dimension household types

Table 7 shows that EV normalised by 2006/07 expenditure (EV/Exp) was higher for renters relative to non-renters (mortgage holders and ‘other’ – ‘other’ typically being trust-type arrangements). This reflects that rents relative to mortgage interest rates rose over the period of analysis and renters spend a larger proportion of their expenditure on goods that increased in price (e.g. food, fuel and household energy), so these price changes affect them proportionally more. The absolute level of EV is roughly similar between the renters and mortgage holders, but significantly higher for the ‘other’ group.

Up to the 44–54 age group, the absolute level of EV rises with age (apart from the younger than 25 age group) reflecting the correlation of age with income to that point (and therefore absolute expenditure on goods that increased in price). Looking at
EV/Exp, the story is different – with the youngest and two older age groups having the highest EV as a proportion of expenditure. This reflects their lower incomes and therefore food, fuel and household energy being a higher proportion of their expenditure bundle. In addition, the very young are likely to be renters, as opposed to mortgage holders, whilst those in the older age groups are more likely to have paid their mortgage off, meaning mortgage payments are not a large proportion of their expenditure.

The goods which experienced large relative price increases (food, fuel and household energy) represent a larger absolute amount of the expenditure bundle of those in higher income quartiles but a smaller proportion of their expenditure. Therefore, the absolute welfare loss owing to relative price changes is larger for households in higher income quartiles but lower as a percentage of expenditure. Single-parent households have the highest EV/Exp of the family structure groups, reflecting the high proportion of necessities that increased in price in their budget share owing to their lower incomes and children. In fact, all household types with children have a higher EV/Exp than the corresponding household types without children (e.g. couple with children has a higher EV/Exp than couple without children). This reflects that households with children spend more on food, energy and petrol relative to total expenditure.

| Home ownership status | Equivalent variation price | Equivalent variation as percentage of 2007 expenditure | Equivalent variation expenditure | Aggregate equivalent variation | Aggregate EV as percentage of 2006/07 expenditure |
|-----------------------|-----------------------------|------------------------------------------------------|--------------------------------|--------------------------------|-----------------------------------------------|
| Renters               | 2816                        | 5.4                                                  | 3646                           | 830                             | 2                                             |
| Mortgage holders      | 2999                        | 4.4                                                  | 3880                           | 881                             | 2                                             |
| Other                 | 3832                        | 4.6                                                  | 3532                           | −300                            | 0                                             |
| Age group             |                             |                                                      |                                |                                 |                                               |
| < 25                  | 3040                        | 4.7                                                  | 1750                           | −1290                           | −3                                            |
| 25–34                 | 2740                        | 3.9                                                  | 803                            | −1937                           | −4                                            |
| 35–44                 | 2744                        | 4.1                                                  | 398                            | −2346                           | −4                                            |
| 44–54                 | 3730                        | 4.6                                                  | 6453                           | 2723                            | 5                                             |
| 55–64                 | 3685                        | 5.2                                                  | 9559                           | 5874                            | 12                                            |
| 65+                   | 2253                        | 5.5                                                  | 2750                           | 497                             | 2                                             |
| Income quartile       |                             |                                                      |                                |                                 |                                               |
| YQ1                   | 1953                        | 8.8                                                  | 3318                           | 1365                            | 6                                             |
| YQ2                   | 2584                        | 5.7                                                  | 3574                           | 990                             | 2                                             |
| YQ3                   | 2966                        | 4.6                                                  | 4875                           | 1909                            | 4                                             |
| YQ4                   | 4105                        | 3.4                                                  | 4165                           | 60                              | 0                                             |
| Qualification         |                             |                                                      |                                |                                 |                                               |
| School or none        | 271                         | 5.0                                                  | 3850                           | 1135                            | 3                                             |
| Bachelor degree       | 3578                        | 3.9                                                  | 436                            | −3142                           | −5                                            |
| Postgraduate          | 3814                        | 4.5                                                  | 5585                           | 1771                            | 3                                             |
| Family structure      |                             |                                                      |                                |                                 |                                               |
| Single, no children   | 1762                        | 5.0                                                  | 2522                           | 760                             | 3                                             |
| Single, children      | 1611                        | 5.5                                                  | 1992                           | 381                             | 1                                             |
| Couple, no children   | 3612                        | 4.5                                                  | 5440                           | 1828                            | 3                                             |
| Couple, children      | 3635                        | 4.7                                                  | 4880                           | 1245                            | 2                                             |
| Other, no children    | 3450                        | 4.0                                                  | −2305                          | −5755                           | −9                                            |
| Other, children       | 3888                        | 4.8                                                  | 12359                          | 8471                            | 17                                            |
5.3. Results by cluster

Table 8 shows that EV is very highly correlated with the total expenditure of clusters, reflecting that clusters with higher expenditure spend more on goods that increased in price. However, once we normalise EV by expenditure, the correlation reverses because the goods which increased in price are a higher proportionate amount of the expenditure bundle of those with low expenditure.

Figure 1 plots EV/Exp against the average age of the cluster. This, we believe, illustrates the strength of our approach. Clusters A, B, C and G all have approximately the same average age but have markedly different EV normalised by expenditure. The less well-off clusters (A, B and C), which spent a higher proportion of their expenditure on necessities are relatively more affected compared with cluster G. Cluster G was also less affected as it has a higher proportion of mortgage holders, and mortgage rates decreased relative to rents. Even amongst clusters A, B and C there are differences in EV, with cluster B being the most affected by price increases. This reflects the fact that cluster B has the highest average number of children meaning this cluster spends a significantly higher share of their budget on food and petrol, which were amongst the items with the largest increases. Using the hard dimension approach, EV/Exp is 4.6% for the 25–34 age group but, as we have shown, this number hides a large heterogeneity in the range of outcome for people in that age group depending on their different attributes (e.g. income, home ownership status and children), and thereby shows the advantages of our clustering approach.

5.4. Aggregate welfare effects

Creedy (2004) shows that the EV measure of welfare effects owing to both price changes and expenditure changes can be aggregated to calculate an overall welfare effect. Table 7 presents the results by our hard dimension groups. Younger age groups were worse off over the recession, with the welfare gain owing to increased expenditure more than offset
by the welfare loss owing to price changes; conversely the 55–64 years old age group had the biggest welfare improvement, reflecting their strong growth in expenditure brought about by their increased employment over the period. Both expenditure and welfare lost owing to price changes increase with income quartile, although the gains to welfare from expenditure increases outweigh the losses from price increases for the first three income quartiles.

Table 8 shows the results by cluster. Clusters J, K, B and D had significant welfare improvements over the recession (when their aggregate EV is normalised by 2006/07 expenditure). Clusters B, D and K all had large welfare losses as a percentage of total expenditure from price changes, therefore, their welfare gain results from large increases in expenditure. B and D benefited from welfare and minimum wage changes boosting their income and therefore expenditure; whilst K, the older working cluster, experienced strong employment growth. Cluster J’s improving welfare, on the other hand, appears to be a function of moderate welfare losses from price changes and moderate gains in expenditure.

6. Conclusion
This paper offers two contributions. The first is to quantify welfare changes between 2006/07 and 2009/10 for different types of households in New Zealand; a period that included the 2008/09 recession. Given the effects of the recession are likely to be ongoing, we have only quantified some initial impacts. We highlighted one often overlooked channel through which there can be variations in welfare changes for different household types: price changes. We found those in the low-income groups, those with children and/or those who rented had large welfare losses owing to price changes. The relatively large impact on low-income groups and those with children reflects that goods that increased in

Figure 1. EV normalised by 2007 expenditure versus age.
price were generally a larger part of their expenditure bundle; whilst the larger welfare impact on renters versus homeowners reflects rents rising relative to mortgage rates. For those in lower income groups, these welfare losses owing to price changes were more than offset by strong expenditure growth, with those in income quartile one having the largest welfare gain of all quartiles. The strong expenditure growth in the lowest income quartile partly reflects transfers and minimum wage changes. However, it is intuitively clear that these groups are still worse off than if there had been no recession. In terms of the age dimension, the 55–64 years old age group had the biggest welfare improvement, reflecting their strong growth in expenditure brought about by their increased employment over the period.

The second contribution of this paper is the application of clustering to form the household types. The advantage of clustering techniques is it allows us to follow household types through time that are more ‘similar’ on a number of dimensions than can be achieved with groups split on one hard dimension. This allows us to pick up differences within certain groups that may otherwise be missed. For example, we created three older clusters – crudely one that is working, one that is working part-time and one with retired people – and showed that in the time period studied the older working and part-time working clusters grew in number and experienced strong income growth, whilst the non-working one did not. This inference would be missed if one just looked at the age group results in our hard dimension analysis. By differentiating the younger age group by home ownership status, qualification and income level, our clusters allow three inferences over the recession. First, there was a shift towards renting from home ownership in the younger age group – perhaps, reflecting a reluctance to take on debt or tightening of lending standards by banks. Second, it was harder for younger qualified people to find high-paying jobs. Third, we were able to show, by differentiating households on their exposure to the housing market, that highly geared households and households with large mortgage payments relative to income reduced their durable expenditure, perhaps, indicating a desire to reduce debt.

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Access to data used in this study was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are work of the authors and not Statistics New Zealand.

Notes

1. Based on the December 2012 quarter GDP release.
2. We also supplement the HES market income data with tax and cash benefit data from Taxwell, Treasury’s micro-simulation model.
3. Ball and Ryan (2013) provide sample counts and population weights for each household type.
4. Specifically the square root scale, see Ball and Ryan (2013) for details.
5. A full list of price changes is available in Ball and Ryan (2013).
6. The effective mortgage rate is the mortgage rate at each maturity weighted by the proportion of mortgages outstanding at each maturity and can be thought of as the average mortgage rate applying to households; it is available at: http://www.rbnz.govt.nz/statistics/exandint/b2/.
7. Based on the ordinal ranking system used in HES to rank qualifications from 0 (no qualification) to 8 (Ph.D.); 5 is a bachelor's degree, rather than the three categories outlined in Section 2.1. More details available on request.

8. We use disposable income rather than equivalised disposable income as number of children enters separately.

9. Working for families is excluded from transfers as it is strongly correlated with number of children. Number of children enters as another dimension in the clustering.

10. In Ball and Ryan (2013), we briefly review the literature around clustering techniques and categorical variables and explain how they have been treated.

11. Additional information on transfer payments and budget shares of certain items are reported in Ball and Ryan (2013).

12. Quartile 1 had the strongest wage and/or salary income growth, 16%, relative to 14% for all quartiles. We cannot be definitive but this may reflect increased hours worked per household and/or wage increases. Part of these wage increases could reflect minimum wage changes. The adult minimum wage rose from $11.25 an hour to $12 an hour on 1 April 2008, which would have boosted incomes for some workers in the lower quartile.

13. Figure 5.6 in Ball and Ryan (2013) illustrates this point.

14. The use of an LES does give rise to potential well-known problems with additivity (see Deaton (1974)), although the level of aggregation we generally use on the expenditure groups may mean these issues are less severe.

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