Reserve Bank of New Zealand Analytical Notes

Vulnerability of new mortgage borrowers prior to the introduction of the LVR speed limit:
Insights from the *Household Economic Survey*

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NON-TECHNICAL SUMMARY

This paper uses data from the *Household Economic Survey* (HES) to examine the financial vulnerability of recent owner-occupier mortgage borrowers. We focus on changes in the risk profile of three different cohorts of mortgage borrowers, depending on whether they purchased their house: during the tail end of the housing boom (2005-07), in the years surrounding the Global Financial Crisis (2008-10), or during the more recent recovery in house prices (2011-13). For each cohort, we assess vulnerability along a range of dimensions using a sample of household-level data on debt, property values, incomes and demographics.

The 2011-13 cohort of borrowers is of particular interest, as this period coincides with the lead up to the introduction of the speed limit on high loan-to-value ratio (LVR) mortgage lending in October 2013. The decision to introduce this restriction was driven by a judgement of increasing risks associated with residential mortgage debt, despite the relatively moderate rate of growth in household borrowing for the sector as a whole. Key risk indicators available at the time were an elevated share of high-LVR lending, the high level of debt in the household sector, and a housing market that the Bank assessed to be increasingly overvalued (RBNZ, 2013). We provide a new perspective on the period by assessing the distribution of new borrowing by owner occupiers.

Although the strength of some of our conclusions is limited by the relatively small number of borrowers in some sub-samples, two main results support the proposition that the vulnerability of owner-occupier lending undertaken during 2011-13 was higher than in either 2005-07 or 2008-10. Firstly, typical debt-to-income (DTI) ratios were higher, despite a significant increase in borrower incomes across cohorts. Secondly, there was a greater proportion of high-LVR borrowers that also had an elevated DTI, and are thus likely to be particularly vulnerable to a rise in mortgage rates or a fall in income. These trends could reflect both sharp increases in house prices in the Auckland region and easing in bank lending standards in recent years. Risks remained lower than in 2005-07 along other dimensions, such as the smaller amount of debt taken on in aggregate and the reduced tail of very high DTI lending.

1 INTRODUCTION[1]

In a number of countries, the Global Financial Crisis (GFC) highlighted that a large stock of vulnerable mortgage borrowers can pose considerable risk to financial systems. By showing how debt is distributed across borrowers, household level data can help detect vulnerabilities associated with mortgage debt. This paper uses household level data for New Zealand to assess the vulnerability of new mortgage loans to owner-occupiers between 2005 and 2013, and supplements the more timely analysis of household sector risks found in the Reserve Bank's *Financial Stability Report.*

This paper proceeds as follows. Section 2 outlines our dataset and explains our indicators of financial vulnerability. Section 3 explains the method for grouping respondents into various borrower cohorts. Section 4 investigates how these new borrower cohorts compared to existing mortgage borrowers and all households. Section 5 considers how the share of high-LVR lending has changed over time and across borrowers. Finally, section 6 analyses loan servicing ability across borrower cohorts, while section 7 offers concluding remarks.

2 USING THE HES TO MEASURE FINANCIAL VULNERABILITY

The Reserve Bank has used the HES several times to assess the distribution of owner-occupied mortgage debt (see RBNZ (2006, 2011) and Kida (2009)). The HES contains information on debt, property values, income and demographics, and is currently the best household level dataset available for the years leading up to the introduction of the LVR speed limit. Each survey is based on interviews with a different random sample of around 3200 households, of which typically around 900 have a mortgage. Unfortunately, the HES contains no information on the financial assets or investment properties of households (or on mortgages held against those properties).[2]

A key question for any work using survey data is how representative it is of the population as a whole. Using earlier iterations of the HES, we found that the implied aggregate debt was significantly lower than owner-occupied mortgage debt estimated using other sources.[3] This led to concerns that the data could under-estimate tail risks. The data used in this paper

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[1]   Access to the 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 the work of the authors, not Statistics New Zealand.

[2]   There is currently very little information on debt held against investor property in New Zealand. A net worth module has been added to the 2015/16 HES, which will include information on investment property and many of the other missing components of the household balance sheet.

[3]   Each household has a sample weight reflecting the estimated number of households in the population with similar characteristics. Implied aggregates are constructed by summing debt in the survey using these weights.

make better use of the available unit records, resulting in a significantly closer match to the aggregate data.[4] As shown in figure 1, the implied aggregates from the HES now broadly match the aggregate data for housing debt, after accounting for plausible estimates of investor debt.[5] Although the estimate is still highly uncertain, this has increased our confidence in the data.

Figure 1: Implied housing debt from the HES compared to RBNZ aggregate
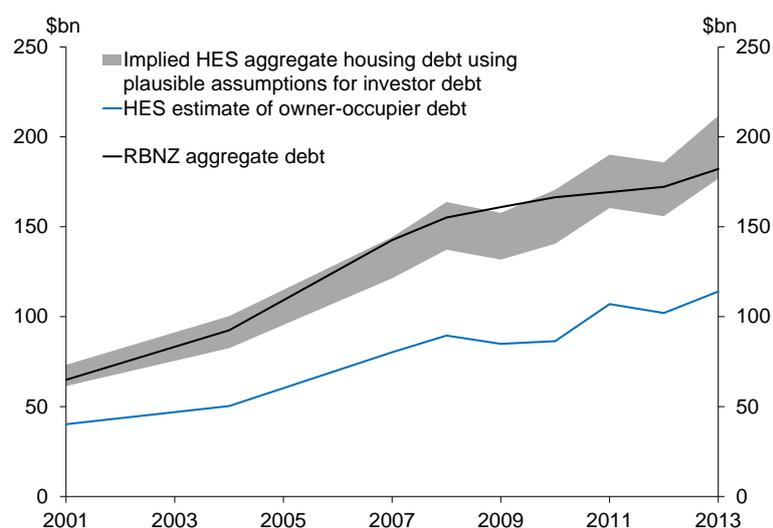
Source: Statistics New Zealand, RBNZ.
Note: The shift from three-yearly to annual surveys after 2007 makes the HES data appear more volatile compared to earlier years.

We calculate several measures of the financial vulnerability associated with new owner-occupier mortgage debt using the HES.[6] These indicators fall into two broad categories:

1. Does the household have adequate cash flow to support mortgage borrowing?

A household that has very little spare cash flow after mortgage payments is vulnerable to an unexpected increase in mortgage rates, reduction in income, or increase in essential expenses. We use several complementary measures of loan servicing ability:

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4   In the latest release of the HES, Statistics New Zealand significantly improved the methodology for creating the data on owner-occupied debt, resulting in an increase in the number of observations for households with a mortgage. For example, observations that had some missing information on certain mortgage characteristics were imputed using sample averages rather than removing the household from the survey. These changes were backdated to the 2007 survey.

5   Estimates of investor debt are based on: the number of private rented properties from the HES; an average investor property value of 70-80 percent of the national mean (sourced from PropertyIQ); a constant share of mortgaged investor properties of 60-70 percent (based on 2001 data from the Household Savings Survey (HSS)); and a constant average LVR of 60-70 percent for investment properties with debt held against them (again based on the HSS).

6   We remove any observations that have an estimated DTI of greater than 10 and an estimated LVR at origination of greater than 120, which we consider to be implausible.

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- The debt servicing ratio (DSR), defined as the proportion of disposable income that is used to service the mortgage(s), including both interest and principal payments.

- The net income surplus (NIS), defined as the amount of disposable income left over once debt payments are made and 'essential' household items purchased. The advantage of this indicator is that it takes account of an estimate of essential expenses for the household. As discussed in Appendix 1, we estimate essential expenditure using the lower quartile of actual expenditure for different family types and income levels.

- The debt-to-income ratio, defined as the ratio of mortgage debt to after-tax disposable income (including government transfers). A higher DTI will imply a higher DSR for a given interest rate and mortgage term. A key feature of the DTI is that it is invariant to the current level of mortgage rates.

Because mortgage rates have varied significantly over our sample, and are currently very low, we primarily focus on DTI as an indicator of underlying servicing ability.

2. How large is the equity buffer of the household?

Another key indicator of financial vulnerability is the LVR. If a household is struggling to service their mortgage but has significant equity in their house, they can potentially sell the house and repay the bank, draw down on their equity, or refinance with another lender. On the other hand, if such a household has negative equity – the value of their mortgage exceeds the value of their home – the situation is much worse. A high LVR indicates an increased likelihood that the household will have negative equity following any given correction in house prices.

International studies have found that stretched servicing and equity indicators significantly increase the probability that a household defaults on the mortgage or experiences financial stress. Read *et al* (2014) focus on the Australian experience during the post-GFC period, and find that the probability of experiencing mortgage difficulties increases with DSR, and rises significantly at LVRs above 90 percent. Lydon and McCarthy (2011) study the determinants of mortgage default in Ireland - a particularly interesting case study in light of the sharp fall in house prices and increase in unemployment since the GFC - and also find a strong role for both LVR and servicing indicators. Qualitatively similar findings for the UK and Canada are reported in May and Tudel (2005) and Dey *et al* (2008).

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3 DEFINITION OF BORROWER COHORTS

Since 2007, the HES has been conducted every year, compared to every three years between 1998 and 2007.[7] The more frequent surveying over this period increases the available sample size to around 23,000 households, of which 6,249 have a mortgage. We take advantage of this larger sample to construct a dataset of new borrower cohorts over three periods: 2005-07, 2008-10, and 2011-13.

The focus on recent borrower cohorts allows us to clearly detect changes in the risk profile of gross mortgage lending over time. Movements in the entire stock of mortgage lending are much more slow-moving, and can sometimes disguise a build-up in vulnerabilities. For example, rapid increases in asset prices during a credit boom are usually associated with falling LVRs on the stock of mortgage lending, at the same time as LVRs on new borrowing are increasing. Of course, the overall riskiness of bank portfolios can also be influenced by debt repayment among existing borrowers, which is a topic left for future work.

The three borrower cohorts were deliberately chosen to cover three different phases of the housing market (figure 2). The 2005-07 cohort was borrowing at the tail end of the housing boom, amidst strong housing activity and sharp increases in house prices. By contrast, the 2008-10 cohort was borrowing during a period of falling prices and very weak house sales. More recently, the 2011-13 cohort has again generally experienced rising house prices, although sales per capita have remained much lower than 2005-07. Another notable feature of the 2011-13 period is a significant increase in the share of market activity accounted for by Auckland buyers.

Figure 2: Features of the housing market across time
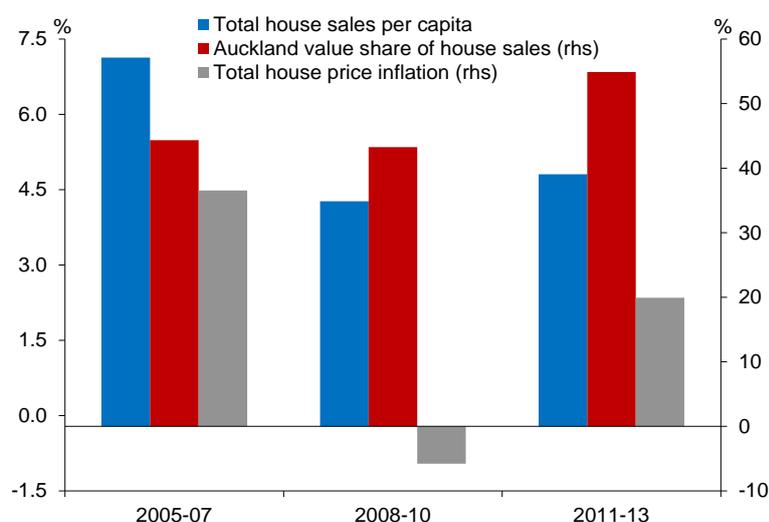
Source: REINZ, Statistics New Zealand.

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[7]   A more detailed survey with comprehensive questions on expenditure is undertaken every three years.

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There are two conditions for a household to enter a borrower cohort:

1. Must have purchased a house using mortgage debt within the relevant period.
2. Must have been surveyed no more than 2 years after purchasing their house.

As shown in figure 3, each cohort could potentially contain households from a number of survey dates.[8] As the data for household income, debt, and many other variables used in this paper are based on the survey date, condition 2 is designed to ensure that the data still provide a reasonable picture of the risk characteristics of the borrowers 'at origination'.[9]

This methodology results in around 1,250 households that are the focus of our analysis. As might be expected from figure 3, the number of households within each cohort is not even. As shown in figure 4, the proportion of surveyed households that are captured in our cohorts has declined significantly since 2005-07, in line with the decline in house sales per capita. The 2008-10 cohort is largest, at 500 households. The first cohort is only slightly smaller, despite relying on fewer surveys to make up the cohort. The third cohort is the smallest, but still has a reasonable sample size at 250 households. Although these cohort sizes should be sufficient to draw reliable conclusions in most cases, conclusions based on sub-samples within cohorts are inevitably more tentative.

Figure 3: The relationship between borrower cohort and survey date

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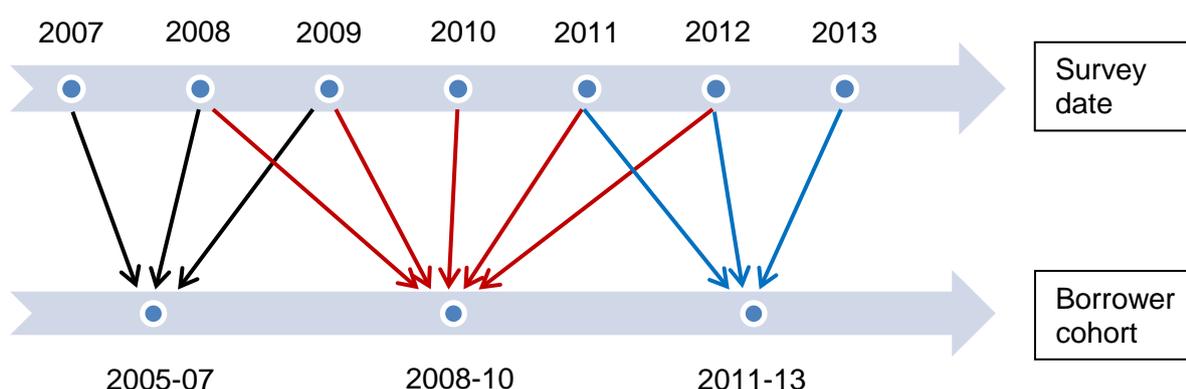
[8]   See Appendix 2 for detailed examples demonstrating the cohort classification system.
[9]   Households are asked to provide their current loan balance from their bank statement at the time of the survey. If the current loan balance is missing, we impute the current balance based on the initial balance, mortgage term, interest rate and loan structure – under the assumption that principal payments are made according to schedule. Property values in the HES are based on the most recent Rateable Value of the property. We update these values using the PropertyIQ house price index for the relevant local authority.

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Figure 4: Share of households in HES in purchaser cohort
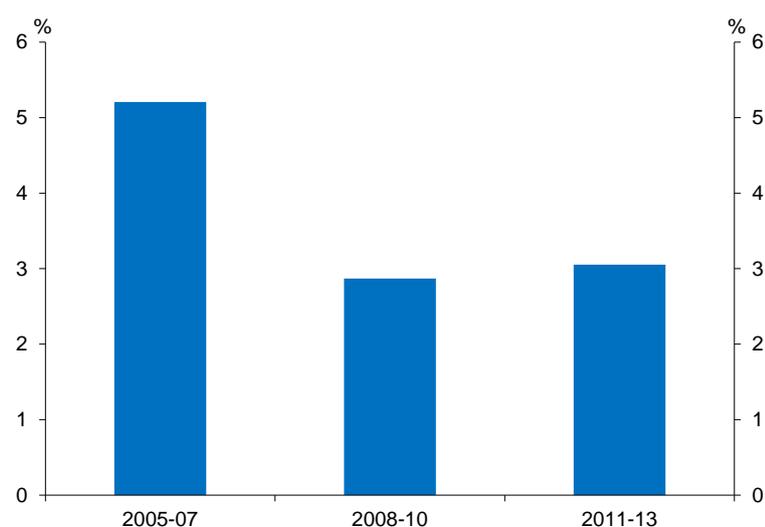
Note: Share refers to the number of households within each cohort, as a percentage of all households in the HES eligible for inclusion based on their survey date.

One potential problem with this classification system is that households in earlier cohorts (particularly the 2005-07 cohort) may have longer, on average, to pay down debt and grow incomes. This problem is partly mitigated by only including households that took the survey within two years of moving in. To assess the extent of potential bias, we compared the average time since the household moved in and the ratio of current debt to original debt across cohorts. This exercise suggested that the results are unlikely to be significantly affected, with the 2005-07 cohort only having an additional four months, on average, to reduce debt and grow incomes relative to the latest cohort.[10] We also experimented with reducing the maximum time between survey and mortgage dates to one year (at the expense of sample size) and found that the results were not materially affected.

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[10]   Based on standard amortisation rates at the early stages of a mortgage and average income growth, the extra four months of debt repayment might bias the debt-to-income ratios (the most heavily affected metric) in the 2005-07 cohort by approximately 2-3 percent.

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4 COMPARISON OF BORROWER COHORTS WITH OTHER HOUSEHOLDS

Table 1 compares the median characteristics of the cohorts of new owner-occupier mortgage borrowers, across the entire 2005-13 sample, to all households, existing mortgage holders, and non-mortgaged households. New cohorts exhibit a number of distinctive features:

1. Recent buyers have a median age of 38 years, lower than the median of 44 for all mortgage holders, and 65 for non-mortgaged owner-occupier households. Around 40 percent of recent buyers are less than 36 years old. Although we do not have accurate data on the first-home buyer share, these younger buyers are more likely to be first-home buyers (FHBs), while the other 60 percent are more likely to be trading up to their second (or subsequent) home.

2. At $72,700, the disposable income of recent buyers is over $20,000 higher than the median for all households. A similar gap can be observed between existing mortgage holders and the overall population, while non-mortgaged households tend to have significantly lower incomes. Despite being much younger, recent buyers less than 36 years of age have broadly similar incomes to other recent buyers.

3. Recent buyers have a median debt of $219,400, significantly higher than the median debt of $147,000 of existing debt holders. This could be due to recent buyers being younger and therefore having not yet paid down debt to the same extent, as well as the fact that recent buyers have typically faced higher house prices than existing owners over our sample period. The data on median debt and house prices broadly accord with external sources.[11]

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[11]   We estimate an average new commitment size of around $235,000 over the 2005-13 period. This is based on a median house price of $336,600 (a weighted average over the sample period) and an assumed average LVR of 70 percent for new commitments (in accordance with data from the *Residential Mortgage Commitments Survey* prior to LVR restrictions).

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Table 1: Comparison of borrower cohorts to other households[12]

(median within category)

	All households	Owner-occupiers with no mortgage	Owner-occupiers with a mortgage	Recent buyers	Recent buyers <36 years old
Sample size	22,992	7,833	6,249	1,248	498
Age of reference person (years)[13]	48	65	44	38	29
Disposable income ($)	52,500	42,800	70,600	72,700	72,400
Debt on owner-occupied property ($)	-	-	147,000	219,400	232,000
Value of owner-occupied property ($)	-	-	343,000	354,000	321,200
Remaining mortgage term (years)	-	-	19	24	25

Over the sample, borrower cohorts have become increasingly skewed to higher income households (figure 5). Median disposable incomes of the 2011-13 cohort were more than 30 percent higher than those of the 2005-07 cohort, an increase well in excess of the increase in aggregate incomes over this period. The share of lending (by value) directed to households within the top household income quintile of the HES has increased from 40 percent in 2005-07 to more than 52 percent in 2011-13.

There are a number of factors that could explain this increasing skew towards high income borrowers. Firstly, the share of lending to Auckland buyers has increased from 35 percent in 2005-07 to more than 52 percent in 2011-13. As Auckland households tend to have higher than average incomes, this is likely to have increased the average incomes within borrower

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[12]   Information on house values for non-mortgaged households is not available within the dataset.
[13]   Reference person refers to the adult within the household that responded to the survey on behalf of the household.

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cohorts. Secondly, the significant increase in the house price-to-income ratio in Auckland is likely to have made it more difficult for younger or low income buyers to enter the market. Consistent with this, the share of lending to younger borrowers has declined over time. Finally, banks significantly tightened lending standards in the wake of the GFC. This may have led banks to target lending towards higher income, and typically lower risk, borrowers during the 2008-10 period.

Figure 5: Non-debt characteristics of borrower cohorts over time (by value)
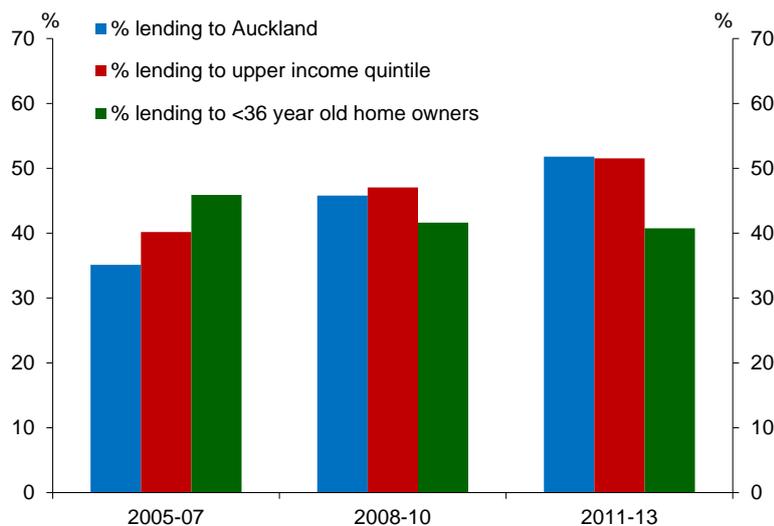
Note: Sample size for this figure ranges from 72 to 510.

5 EVOLUTION OF LOAN-TO-VALUE RATIOS

A key reason for introducing the speed limit was the elevated share of high-LVR lending between early 2012 and late 2013. We know from data collected from registered banks that the high-LVR share of all residential mortgage lending was around 30 percent prior to the introduction of LVRs, even higher than during 2006/early 2007 when the share was between 20 and 25 percent.

Although our figures are not fully comparable, they tell a broadly similar story (figure 6).[14] There is a significant rise in high-LVR lending (defined as lending with an LVR exceeding 80 percent) among the 2011-13 cohort to 50 percent of lending, higher than the 40 percent

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[14]   The share of high-LVR lending is much higher in our data than reported by banks. A key reason for this is that the bank data includes refinancing and investor debt, whereas our cohorts only include lending to owner-occupier house buyers. As refinancing is more prevalent among existing owners, and investors tend to have lower LVRs, this would tend to produce a lower ratio of high-LVR lending. Banks have indicated that a significant share of low-LVR commitments relate to refinancing and investor debt, and this is consistent with recent evidence from new commitments data. The HES data does include refinancing where the house buyer undertakes this is in the first two years after purchase. This could also potentially explain the higher LVR shares.

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among the 2005-07 cohort. This came after a substantial fall in high-LVR lending in 2008-10 to around 20 percent. There is also an increase in the contribution of Auckland to high-LVR lending from 34 to 58 percent, consistent with the strong rise in Auckland house prices in recent years.

Figure 6: Share of high-LVR lending by value (excludes refinancing)
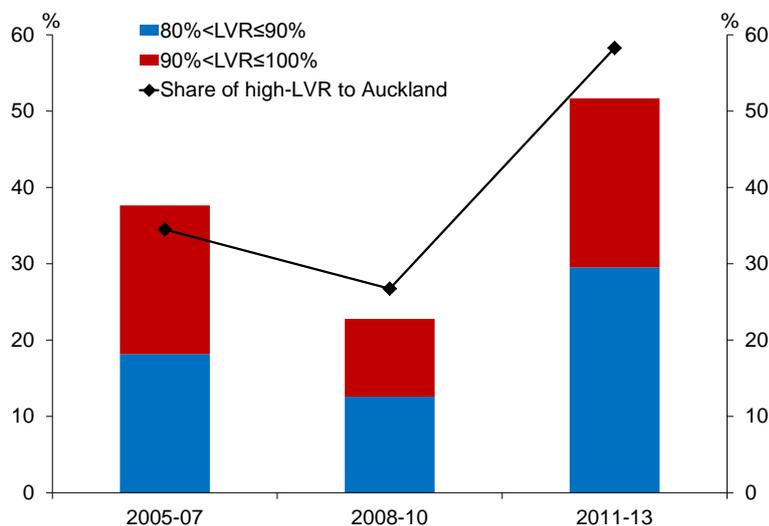
Note: Debt is from the time the household took the survey. House value is based on an estimate of the house value at the time the household moved in. Number of high-LVR borrowers has a minimum of 33; number in Auckland gets as low as 12, which may affect the reliability of the estimates.

There are significant differences in the share of high-LVR lending by age bracket (figure 7). The value share of high-LVR lending in the traditional FHB age group of less than 36 year olds has been relatively steady across cohorts at between 35 and 45 percent across cohorts. By contrast, the share of high-LVR lending among older households fell from around 35 percent in 2005-07 to 15 percent in 2008-10, and then increased sharply to 50 percent. The increase in high-LVR lending among older borrowers since 2005-07 could partly reflect an increase in the average age of FHBs, particularly if many FHBs chose to defer entering the housing market during 2008-10. High-LVR lending among existing owner occupiers may also have varied over time. Such households may have been reluctant to trade up during 2008-10 due to the increased uncertainty around the sale price of their existing property. As a result, many may have delayed trading up until the market recovered during 2011-13.

Figure 7: High-LVR lending by age bracket (excludes refinancing)
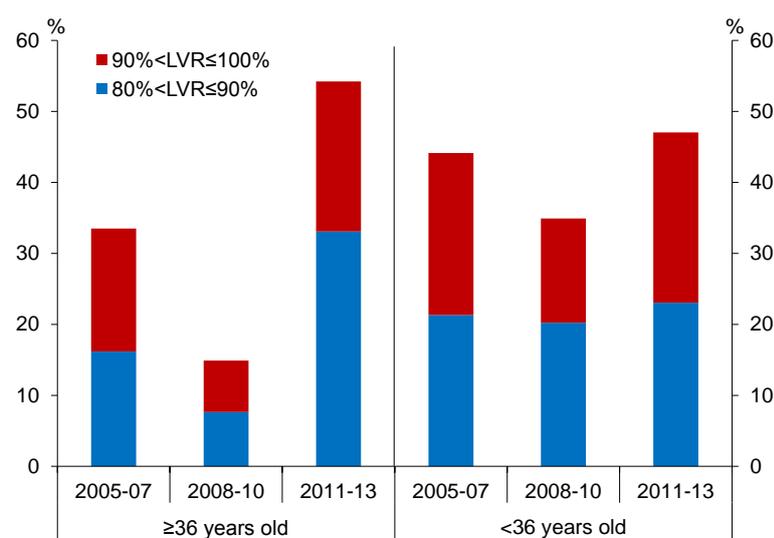
Note: See note to figure 6. Sample size for this figure ranges from 15 to 30.

6 EVOLUTION OF LOAN SERVICING ABILITY

At the time that the speed limit was introduced, the *Regulatory Impact Statement* noted evidence from the GFC and overseas that high-LVR lending tended to have higher default rates (RBNZ, 2013). However, there was very little hard data on loan servicing ability among recent borrowers, which represents another key indicator for default rates. The HES data allow us to explicitly assess the servicing capacity of the recent cohort of owner-occupier borrowers.

New debt taken on with a limited servicing buffer has declined markedly since 2005-07 (figure 8). This likely reflects significantly lower mortgage rates and the increased share of borrowers with a high income.[15] The proportion of debt where total mortgage payments exceed 40 percent of income in 2011-13 was less than half of that in 2005-07.[16]   The proportion of debt owed by borrowers with a NIS of less than $10,000,[17] after accounting for spending on debt payments and essential expenses, has also declined markedly.

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[15]   To provide an indication of the change in mortgage rates faced by new borrowers over time, we examine the median mortgage rate within each cohort. We find median mortgage interest rates of 8.05 percent, 6.39 percent, and 5.73 percent, in the 2005-07, 2008-10, 2011-13 cohorts, respectively.

[16]   For these borrowers, almost all of the mortgage payment – on average, around 80 percent – is interest. This suggests they are especially vulnerable as they would not gain significant relief by shifting to interest only in the event they have difficulty servicing the mortgage. This is true for all cohorts.

[17]   This implies that an unexpected increase in required expenditure of up to $10,000 would result in the household having no additional income for discretionary spending. Based on the median ratio of net income surplus to debt, half of the borrowers within this group would exhaust their net income surplus if mortgage interest rates rose by 155 basis points (without a corresponding increase in income). The $10,000 figure is not inflation adjusted, and so will represent a more severe situation for households in the latter cohorts.

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Figure 8: Debt held by households with a limited servicing buffer
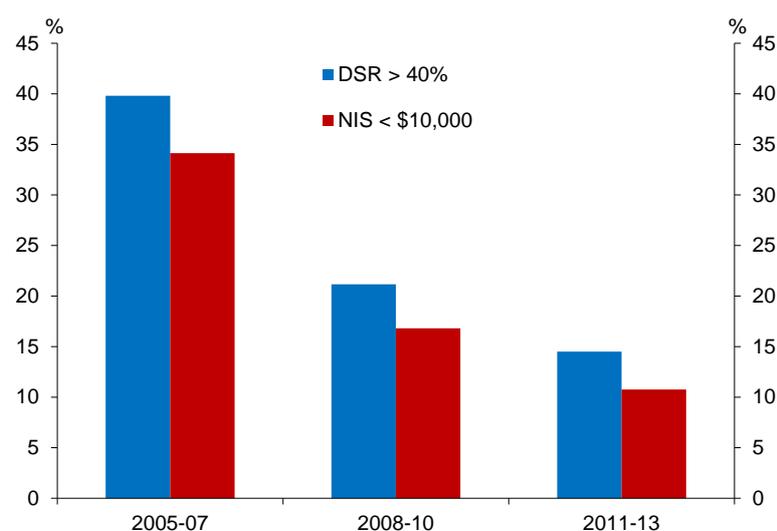
Note: The minimum sample size for this chart is 33.

With mortgage rates currently around their lowest level for several decades, we need to be careful in drawing too much comfort from these results. As noted above, DTIs are a simple metric that get at the underlying servicing capacity of households independent of current mortgage rates.[18] There was some deterioration in DTIs among the 2011-13 cohort, following an improvement between 2005-07 and 2008-10 (figure 9):

- Despite an increased proportion of borrowers with a high income, the median DTI increased to 3.3, compared to 3.1 in 2005-07 and 2.9 in 2008-10. Around 73 percent of debt was originated at a DTI of greater than 3, up from 68 percent in the 2005-07 cohort. The increase in typical DTIs is likely to partly reflect the strong rise in Auckland house prices in recent years. In addition, anecdotal evidence suggests that banks became more willing to lend at elevated DTIs during 2011-13, after tightening up on this lending during 2008-10.

- The share of lending with both an elevated DTI and high-LVR increased to 15 percent, significantly higher than the 10 percent in 2005-07. However, the proportion of lending at very elevated DTIs (>4 and >5) was still lower than in 2005-07. This latter result may reflect tighter lending criteria applied by banks in the post-GFC environment, or changing borrower attitudes towards debt.

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18   Unfortunately we do not have data on the type of mortgage rate (e.g. 2 year fixed versus floating), which makes it difficult to test how much the NIS and DSR would increase if mortgage rates were to return to more normal levels. We plan to investigate this further in the follow-up paper, which will include interest rate stress tests.

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These results suggest a move towards more stretched debt-to-income ratios between the 2008-10 and 2011-13 cohorts. The comparison with 2005-07 is more complicated. On the one hand, the reduction in the proportion of lending with a very stretched DTI suggests an increase in resilience. On the other hand, the increased share of high-DTI lending undertaken with a low deposit suggests that the likelihood of losses to the banking system on new borrowers' loans would be greater in a stress event, where servicing becomes more difficult and/or house prices fall.

Figure 9: Distribution of DTI multiples (after-tax income)
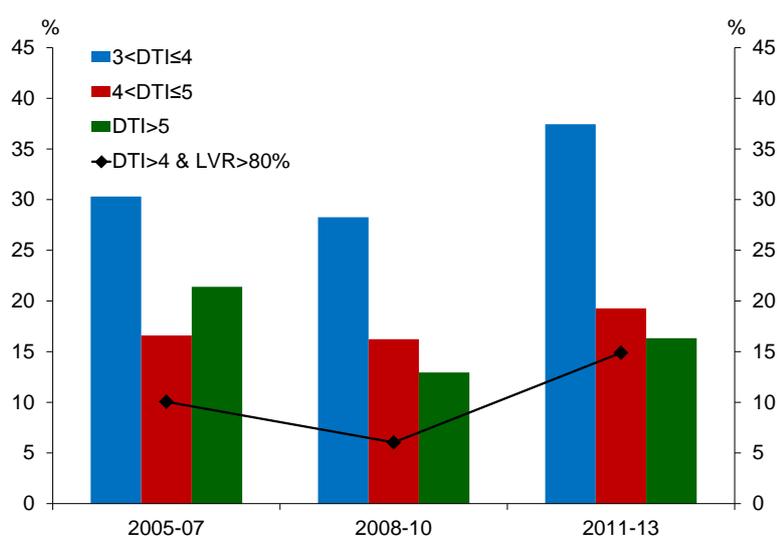
Note: Debt and income are both from the time the household took the survey. Sample size for this figure ranges from 36 to 141.

Analysis of banks' online mortgage calculators suggests that most banks will lend at much higher DTIs to high income borrowers than low income borrowers. Owner occupiers with an income of greater than $80,000 do account for almost half of high DTI lending in the 2011-13 cohort (figure 10). However, this is significantly lower than their share of total lending of around 70 percent. By number, such households account for only 30 percent of owner occupiers with a high DTI.[19] Subject to the caveat that our sample of high DTI borrowers is relatively small, this suggests that owner-occupiers with a high DTI are more likely to have an income below $80,000 than those with a low DTI (despite banks' preference to supply high DTI loans to high income households).

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[19]   We investigate the plausibility of this result by cross-tabulating income and loan data for high-DTI borrowers. Income-debt combinations appear plausible, with banks' mortgage calculators suggesting they would be willing to originate similar loans in most cases. However, income volatility, or a misreporting of income may account for some of the observed high-DTI loans at low incomes.

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Figure 10: High income share of borrowers and lending by DTI (2011-13 cohort only)
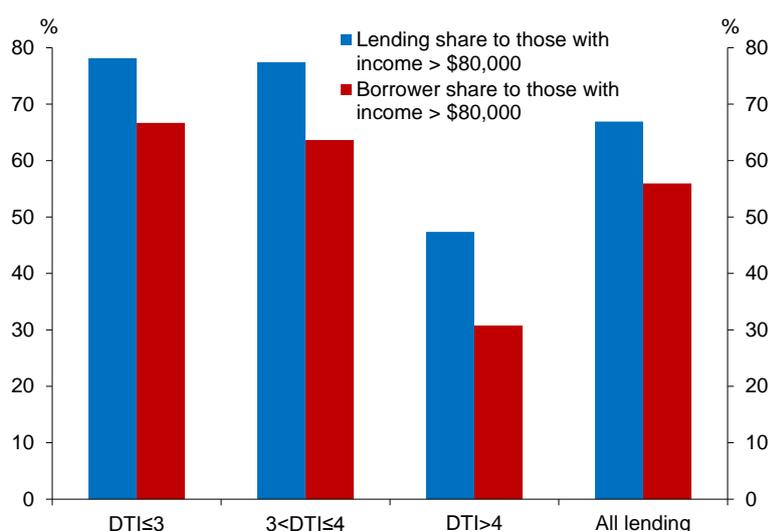
Note: The minimum sample size for this chart is 15. Income refers to after tax disposable income (including government transfers).

7 CONCLUSION

This paper examined the vulnerability of new lending to owner-occupiers during the lead up to the introduction of the LVR speed limit, using a sample of borrowers from the HES. We find an increase in typical DTI multiples compared to earlier years, in addition to the well-known rise in the share of high-LVR lending. The proportion of borrowers with both a high-DTI and a high-LVR also increased sharply and was higher than prior to the GFC. These results are consistent with an increase in the vulnerability within the 2011-13 cohort, although the quantum of lending undertaken and the tail of very high DTI borrowers both remained smaller than prior to the GFC. An assessment of the vulnerability of other borrower types – including investors and owner occupiers that have not recently bought – is left for future work.

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REFERENCES

Dey, S., R. Djoudad, and Y. Terajima (2008) 'A tool for assessing financial vulnerabilities in the household sector', Bank of Canada *Review,* 2008(3), pp 45-52.

Kida, M. (2009) 'Financial vulnerability of mortgage-indebted households in New Zealand - evidence from the HES', Reserve Bank of New Zealand *Bulletin,* 72(1), pp 5-12.

Lydon, R. and Y. McCarthy (2011) 'What lies beneath? Understanding recent trends in Irish mortgage arrears', Central Bank of Ireland Research Technical Paper.

May, O. and M. Tudel (2005) 'When is mortgage indebtedness a financial burden to British households? A dynamic probit approach', Bank of England Working Paper, 277.

Read, M., C. Stewart and G. La Cava (2014) 'Mortgage-related financial difficulties: Evidence from Australian micro-level data', Reserve Bank of Australia Research Discussion Paper, 2014-13.

Reserve Bank of New Zealand (2006) 'Household balance sheets evidence from microeconomic data' in *Financial Stability Report,* May 2006, pp 13-14.

Reserve Bank of New Zealand (2011) 'Financial vulnerability of owner-occupied mortgage debt' in *Financial Stability Report,* November 2011, pp 20-21.

Reserve Bank of New Zealand (2013) 'Regulatory impact assessment: Restrictions on high-LVR residential mortgage lending', http://rbnz.govt.nz/financial_stability/macro-prudential_policy/5407434.pdf.

APPENDIX 1: ESTIMATES OF ESSENTIAL EXPENDITURE

Most banks use the net income surplus metric in mortgage origination tests, which requires an assumption about the minimum level of household expenditure. The triennial expenditure module of the HES allows us to estimate essential expenditure using actual data.

Our primary measure takes the lower quartile of household expenditure on regular and recurring items within each sub-group, where regular and recurring items include food, clothing, health, transport, communication, energy, insurance, personal care, services, and recreation. To define sub-groups, we first categorise households into eight different family types, and then further group based on within-type income quartiles. This allows us to more accurately capture how spending patterns would likely differ across household types and income groups under a situation of financial stress. We then add each household's actual expenditure on rates, dwelling insurance and consumer debt to obtain our measure of essential expenditure.[20] We linearly interpolate values between triennial surveys to obtain essential expenses for the entire sample.

Table A1 provides a selection of values for essential expenses, based on this approach. As expected, essential expenses are generally higher among larger households, and have tended to increase over time. We also observe significant differences in modelled essential expenses across income groups. Within all family types, essential expenses are more than twice as high among households in the top income quartile relative to households in the bottom income quartile. This might suggest that origination tests which rely on measures of essential expenditure that are invariant to the households income could significantly overstate the extent to which high income households would be able to cut back on expenses in a stress scenario.

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[20]   When households report unrealistic expenditure values for rates, we infer values based on their house value and the average ratio of rates to house value within the relevant region. Similarly, we infer missing (or unrealistic) expenditure values for dwelling insurance by multiplying the house's improvements value by the relevant region's average insurance cost per dollar of improvements.

Table A1: Modelled essential expenses by sub-group based on the HES (dollars)

	2007			2010			2013		
	All families	Low income families	High income families	All families	Low income families	High income families	All families	Low income families	High income families
Single person with no children	7,954	5,786	14,043	9,315	6,713	16,443	9,741	6,160	16,660
Single person with one child	11,079	8,005	19,593	10,820	8,138	18,892	12,343	10,921	21,872
Single person with two or more children	12,493	10,256	21,969	13,710	10,086	23,003	13,362	11,212	28,580
Couple with no children	17,439	13,645	28,915	20,401	14,850	30,695	21,302	15,024	34,879
Couple with one child	21,525	16,024	32,736	22,505	13,382	36,758	23,246	16,549	37,630
Couple with two children	23,931	18,012	36,059	27,822	18,624	41,913	29,329	17,872	48,139
Couple with three or more children	24,523	15,330	41,978	26,874	19,429	41,804	29,679	18,654	47,156
Multi-family households	19,779	12,907	34,208	21,276	15,136	34,823	23,880	16,963	41,781

Note: Low (high) income families refers to families within the bottom (top) income quartile for that family type. The column for all families displays values that would apply assuming that essential expenditure differed by household type, but not income quartile. Multi-family households include all households where a resident of the house is unrelated to the household head, and represent approximately six percent of the sample.

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APPENDIX 2: CLASSIFICATION OF HOUSEHOLDS INTO VARIOUS COHORTS

Table A2: Stylised examples of households and their classification into cohorts

Household number	House purchase date	Survey date	Purchased with mortgage debt?	Cohort	Comments
1	March 2004	March 2007	Yes	None	House not purchased within a relevant cohort period
2	August 2005	March 2007	Yes	2005-07	House purchased within the relevant period, within two years of the survey date, with mortgage debt
3	August 2005	March 2007	No	None	House not purchased with mortgage debt
4	None	September 2008	N/A	None	No house purchased
5	January 2007	September 2008	Yes	2005-07	House purchased within the relevant period, within two years of the survey date, with mortgage debt
6	February 2008	September 2008	Yes	2008-10	House purchased within the relevant period, within two years of the survey date, with mortgage debt
7	November 2009	March 2012	Yes	None	Household not surveyed within two years of house purchase date
8	May 2010	March 2012	Yes	2008-10	House purchased within the relevant period, within two years of the survey date, with mortgage debt
9	June 2011	March 2012	Yes	2011-13	House purchased within the relevant period, within two years of the survey date, with mortgage debt