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BANK**

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T E P Ū T E A M A T U A

Consultation Paper: Serviceability Restrictions as a Potential Macroprudential Tool in New Zealand

The Reserve Bank invites submissions on this Consultation Paper by 18 August 2017.

Please ensure that responses are sent in before the closing date. Submissions received after this date cannot be considered.

Submissions and enquiries about the consultation should be addressed to:

Attention:

Head, Macro Financial Department

Reserve Bank of New Zealand

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When responding, please state whether you are doing so as an individual or on behalf of an organisation.

Publication of submissions

Important Disclosure Statement

All information in submissions will be made public unless you indicate you would like all or part of your submission to remain confidential. Submitters who would like part of their submission to remain confidential should provide both a confidential and public version of their submission. Apart from redactions of the information to be withheld (i.e. blacking out of text) the two versions should be identical.

Submitters who request that all or part of their submission be treated as confidential should provide reasons why this information should be withheld if a request is made for it under the Official Information Act 1982 (OIA). These reasons should refer to section 105 of the Reserve Bank of New Zealand Act 1989, section 54 of the Non-Bank Deposit Takers Act, section 135 of the Insurance (Prudential) Supervision Act 2010 (as applicable); or the grounds for withholding information under the OIA. If an OIA request for redacted information is made the Reserve Bank will make its own assessment of what must be released taking into account the submitter's views.

The Reserve Bank may also publish an anonymised summary of the submissions received in respect of this consultation paper.

June 2017

1. Executive Summary

In 2013, the Reserve Bank introduced macroprudential policy measures in the form of loan-to-value ratio (LVR) restrictions to mitigate the risks to financial system stability posed by a growing proportion of residential mortgage loans with high LVRs (i.e. low deposit or low equity loans). This increase in borrower leverage had gone hand-in-hand with significant increases in house prices, particularly in Auckland. The Reserve Bank's concern was the possibility of a sharp fall in house prices, in adverse economic circumstances where some borrowers had trouble servicing loans. Such an event had the potential to undermine bank asset quality given the limited equity held by some borrowers.

The Reserve Bank believes LVR restrictions have been effective in reducing the risk to financial system stability that can arise due to a build-up of highly-leveraged housing loans on bank balance sheets. However, LVRs relate mainly to one dimension of housing loan risk. The other key component of risk relates to the borrower's capacity to service a loan, one measure of which is the debt-to-income ratio (DTI). All else equal, high DTI ratios increase the probability of loan defaults in the event of a sharp rise in interest rates or a negative shock to borrowers' incomes. As a rule, borrowers with high DTIs will have less ability to deal with these events than those who borrow at more moderate DTIs. Even if they avoid default, their actions (e.g. selling properties because they are having difficulty servicing their mortgage) can increase the risk and potential severity of a housing related economic crisis.

While the full macroprudential framework will be reviewed in 2018, the Reserve Bank has elected to consult the public prior to the review. This consultation concerns the potential value of a policy instrument that could be used to limit the extent to which banks are able to provide loans to borrowers that are a high multiple of the borrower's income (a DTI limit). A number of other countries have introduced DTI limits in recent years, often in association with LVR restrictions. In 2013, the Bank and the Minister of Finance agreed that direct, cyclical controls of this sort would not be imposed without the tool being listed in the Memorandum of Understanding on Macroprudential Policy (the MoU). Hence, cyclical DTI limits will only be possible in the future if an amended MoU is agreed.

The purpose of this consultation is for the Reserve Bank, Treasury and the Minister of Finance to gather feedback from the public on the prospect of including DTI limits in the Reserve Bank's macroprudential toolkit. Throughout the remainder of the document we have listed a number of questions, but feedback can cover other relevant issues. Information provided will be used by the Reserve Bank and Treasury in discussing the potential amendment of the MoU with the Minister of Finance.

We present evidence (section 2) that a DTI limit would reduce credit growth during the upswing and reduce the risk of a significant rise in mortgage defaults during a subsequent severe economic downturn. A DTI limit could also reduce the severity of the decline in house prices and economic growth in that severe downturn (since fewer households would be forced to sharply constrain their consumption or sell their house, even if they avoided actual default). The strongest evidence that these channels could materially worsen an economic downturn tends to come from countries that have experienced a housing crisis in recent history (including the UK and Ireland).

The Reserve Bank believes that the use of DTI limits in appropriate circumstances would contribute to financial system resilience in several ways:

- By reducing household financial distress in adverse economic circumstances, including those involving a sharp fall in house prices;

- by reducing the magnitude of the economic downturn, which would otherwise serve to weaken bank loan portfolios (including in sectors broader than just housing); and
- by helping to constrain the credit-asset price cycle in a manner that most other macroprudential tools would not, thereby assisting in alleviating the build-up in risk accompanying such cycles.

The policy would not eliminate the need for lenders and borrowers to undertake their own due diligence in determining that the scale and terms of a mortgage are suitable for a particular borrower. The focus would be *systemic*: on reducing the risk of the overall mortgage and housing markets becoming dysfunctional in a severe downturn, rather than attempting to protect individual borrowers.

The consultation paper notes that DTIs on loans to New Zealand borrowers have risen sharply over the past 30 or so years, with further increases evident since 2014. This partly reflects the downward trend in interest rates over the period. However, interest rates may rise in the future. While the Reserve Bank is continuing to work with banks to improve this data, the available data also show that average DTIs in New Zealand are quite high on an international basis, as are New Zealand house prices relative to incomes.

Other policies (such as boosting required capital buffers for banks, or tightening LVR restrictions further) could be used to target the risks created by high-DTI lending. The Bank does not rule out these alternative policies (indeed, we are currently undertaking a broader review of capital requirements in New Zealand) but consider that they would not target our concerns around mortgage lending as directly or effectively. For example, while higher capital buffers would provide banks with more capacity to withstand elevated housing loan defaults, they would do little to mitigate the feedback effects between falling house prices, forced sales and economic stress.

The Reserve Bank has stated that it would not employ a DTI limit today if the tool was already in the MoU (especially given recent evidence of a cooling in the housing market and borrower activity), it believes a DTI instrument could be the best tool to employ if house prices prove resurgent and if the resurgence is accompanied by further substantial volumes of high DTI lending by the banking system. The Reserve Bank considers that the current global environment, with low interest rates expected in many countries over the next few years, tends to exacerbate the risk of asset price cycles arising from ‘search for yield’ behaviour, making the potential value of a DTI tool greater.

The exact nature of any limit applied would depend on the circumstances and further policy development. However, the Reserve Bank’s current thinking is that the policy would take a similar form to LVR restrictions. This would involve the use of a “speed limit”, under which banks would still be permitted to undertake a proportion of loans at DTIs above the chosen threshold. By adopting a speed limit approach, rather than imposing strict limits on DTI ratios, there would be less risk of moral hazard issues arising from a particular ratio being seen as “officially safe”. Exemptions similar to those available within the LVR restriction policy would also be likely to apply.

Cost-benefit analysis

The use of a DTI policy instrument would be justified only if the benefits outweigh the costs. In undertaking a cost-benefit analysis, the Reserve Bank has assumed the principal benefit of deploying a DTI instrument would stem from:

- A reduction in the costs of a housing and financial crisis.

The Bank has assumed that the main costs of using a DTI instrument would stem from:

- A reduction in the near-term level of economic activity as a result of the DTI instrument; and
- the cost to some potential homebuyers of having to delay their house purchases.

The consultation paper includes our estimate of these costs and benefits based on an illustrative policy calibration in a hypothetical further worsening of housing market imbalances. If the Reserve Bank ever proposed a policy, it could be different to that illustrative calibration, depending upon the particular circumstances prevailing at the time. Under the illustrative calibration, banks would be required to maintain the share of non-exempt mortgage lending at a DTI exceeding 5 to below 20%. This compares with the current share of high-DTI lending, which is currently reported at around 45% (although the Reserve Bank believes this is an over-estimate that will decline as banks improve their reporting systems).

The table below provides a summary of the Reserve Bank's analysis of these costs and benefits. As shown in the table, net benefits are estimated at just under 0.1% of GDP per annum for the period over which the instrument is used.

Summary of key costs and benefits (per annum)

Key Benefits	Key Costs
Reduced risk of output loss in a crisis (expected value 0.25% of GDP)	Drag on output from policy (~0.1% of GDP)
	Inhibiting some home purchases (~0.07% of GDP)

Inhibiting some home purchases: We have considered the potential welfare costs of a DTI policy carefully. It is natural for many households to wish to own their own home and we assume the costs of them being unable to do so as a result of the DTI policy would be significant for the average affected household. To mitigate this concern, we explore the possibility of providing an exemption to the policy for owner occupiers who wish to purchase and occupy a single relatively low-priced home. Other prospective homeowners for whom this option would not be suitable could consider purchasing a newly built home (using a construction exemption) or approaching a lender that has some speed limit capacity.

We model the potential incidence of the DTI policy under these assumptions. The model analysis suggests that the policy would tend to impact on investors more than owner occupiers, which we consider would mitigate the welfare costs.

Drag on output from policy: The policy could create a modest drag on economic activity since it would likely reduce the level of house prices and consumption slightly (we analyse this using the Reserve Bank's macroeconomic model).

Reduced risk of output loss in a crisis: However, it appears likely that these costs would be outweighed by the potential benefit: reducing the chance and severity of a housing-related economic crisis. We quantify this benefit with reference to the literature on the economic impact of severe housing downturns and judgement about the potential for a DTI policy to reduce the probability and severity of these events.

If the MoU is amended and in the future the Reserve Bank (in consultation with the Minister and Treasury) considers that a DTI policy may be appropriate, we would consult the public again with a more precise proposal and Regulatory Impact Assessment to analyse that proposed policy.

In the meantime, we will continue to work with banks to improve the data on debt to income we are receiving, and continue to use this to assess risk. Even if a DTI tool is not actually used, we consider that the DTI data will be a useful addition to our systemic risk monitoring and should also be useful information for the senior management and boards of lending banks.

The remainder of this paper is organised as follows. Section 2 describes the channels through which a DTI policy (and some alternative policies) would operate. Section 3 outlines evidence that DTIs in New Zealand have risen and are currently quite elevated. Section 4 briefly describes international experience with policies of this sort.

Alternative policies that are under the Reserve Bank's control are discussed in detail in section 5. Some other policies would make banks more resilient while having a limited impact on the resilience of the underlying borrowers (especially capital related policies). LVR and DTI limits are complementary policies, as both LVR and DTI are indicators of the riskiness of a borrower.

Section 6 describes the Reserve Bank's current view on how a DTI limit could work in New Zealand. Finally, section 7 calibrates a hypothetical calibration of the policy and undertakes a cost benefit analysis.

2. Conceptual role of a DTI limit in macroprudential stabilisation

What is a DTI limit, and what problem could it solve?

A serviceability restriction limits the amount that mortgage borrowers can borrow relative to their income. In general, larger loans relative to incomes increase the risk that mortgage borrowers will have difficulty making mortgage repayments. Banks use serviceability assessments as part of their mortgage origination process, as part of checking that the customer is a good credit risk and that the mortgage is a suitable financial product for the customer. One simple form of serviceability assessment is a limit on the debt of the borrower relative to their gross income, or “DTI limit”. For simplicity we use the term DTI limit in this memo, but actual policies, if used in the future, could potentially be specified in slightly different forms.

As described in a recent speech (Fiennes (2016)), the Reserve Bank seeks to apply regulatory discipline in areas where there are significant externalities or information asymmetries, which mean that banks’ incentives may lead them to take decisions that result in outcomes that are not aligned with the interests of wider society. Banks already have an incentive to maintain good underwriting standards and assess credit risks when granting individual loans, as they need to balance their expected returns on their lending against the prospect of losses on those loans in the event of a default. However, at times not all of the risks may be fully internalised by individual banks and borrowers, for example during periods of housing market exuberance. As discussed further in this section, there is evidence that an increase in the volume of high DTI lending may contribute to the build-up of systemic risk, amplifying the effects of the housing market cycle on the wider economy. A bank may have limited reason to assess or internalise the marginal increase in system-wide risk it creates when deciding to grant a high DTI loan in such an environment, ahead of more immediate concerns such as maintenance of market share and profitability. Several years of low interest rates may lead borrowers to conclude interest rates will remain low for the life of the mortgage. DTI limits can help to address these issues, thereby enhancing financial system stability.

In the Reserve Bank’s view, and the view of regulators in other countries, these factors have created a potential role for regulation that ensures mortgage debt remains in a reasonable range relative to the incomes of individual borrowers. Particularly since the global financial crisis (GFC), regulators in a number of countries (including the UK, Ireland, and Norway) have determined that the serviceability assessments being imposed by banks may not always be sufficiently strict, especially when interest rates are very low, and imposed additional rules to enhance financial stability (see section 4 for more discussion).

DTI policies would mitigate the effects of a future housing crisis

The MoU on Macroprudential Policy states the objective of the policy framework is to “increase the resilience of the domestic financial system and counter instability in the domestic financial system arising from credit, asset price or liquidity shocks”. A DTI policy would work towards this by reducing the proportion of new mortgage borrowers that are vulnerable to a rise in interest rates or fall in income. Specifically, a DTI limit would be expected to:

- Reduce the risk of a significant rise in mortgage defaults during a severe economic downturn.
- Mitigate the potential amplification of a downturn due to economic stress and increased house listings among high-DTI households.
- Lean against periods of rapid house price and credit growth, thereby reducing the probability and magnitude of a sharp correction in house prices.

DTI policies could reduce the amplification of a housing market downturn

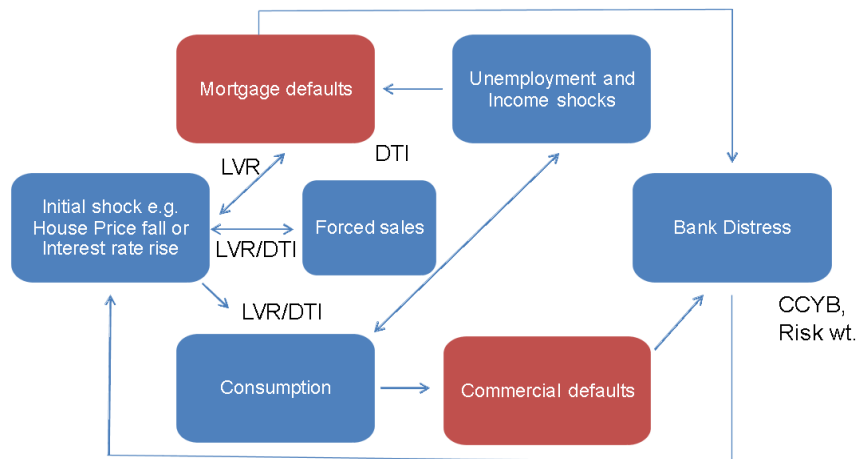
Figure 1 below shows a number of ways in which there are feedback effects between house prices and other economic outcomes including mortgage defaults and consumption. A shock such as a sharp house price fall or rise in interest rates is assumed to trigger a severe economic downturn. In the US and Ireland during the GFC, amongst other countries, these interactions created a feedback loop where falling house prices led to rising unemployment and weaker consumption spending, corporate insolvencies as well as mortgage defaults, and bank distress that led to tightened credit availability. These feedback channels ultimately worsened the economic and financial cost of the crisis in terms of falling GDP and other costs associated with losses on banks' mortgage loans.

Policy options that can potentially dampen each of the feedback channels are marked on the chart. LVR and DTI policies are able to soften these feedback channels:

- Households that have lower DTIs are less likely to miss mortgage payments in the face of unemployment, income or interest rate shocks. By protecting the banking system from sharply rising losses, reducing DTIs will therefore reduce the risk that tighter bank lending standards exacerbate an economic downturn.
- If households have more remaining equity after a fall in house prices (due to LVR policy) and/or have more income available (due to DTI policy), then their consumption will be less affected by a surprise fall in house prices. This reduces the risk that a downturn will become a full-blown crisis. For example, a lot of households sharply reducing consumption will typically lead to some businesses encountering difficulties, increasing unemployment and losses for banks on business-related lending, which all worsen the economic situation.
- Households that have lower DTIs are also less likely to be forced to sell their property (either as a consequence of default or in an attempt to avoid default). Forced sales can reduce house prices further and push borrowers that start with fairly high LVRs into negative equity, creating a feedback loop and pushing prices down even further. Thus reducing DTIs (and reducing LVRs) will reduce the probability of a flood of listings that would exacerbate falling house prices. Economists (see e.g. Shleifer and Vishny (2011)) call forced sales driven by leverage concerns a 'firesale externality' – an externality because it may be individually rational to seek to sell without considering that the collective rush to sell can make it hard for anyone to sell at a reasonable price.

Figure 1 also highlights that increasing the level of banks' capital buffers (e.g. using the countercyclical capital buffer or through higher risk weights for housing) would reduce the risk that distressed banks would exacerbate a crisis by tightening lending standards. However, capital on its own does not impact the feedback effects between falling house prices, forced sales and weaker consumption. Situations can arise where banks are solvent, but unwilling to lend in certain distressed markets except on very conservative terms. For example, even after key UK banks were recapitalised by the UK Government, they still tightened mortgage standards quite substantially, as did banks in most other OECD countries (see Scanlon et al (2010)).

Figure 1: Stylised feedback channels between DTIs and defaults



A DTI limit has some similarities to the LVR restrictions currently in place, in that it would directly constrain the availability of credit to higher risk borrowers. However, the DTI limit would be likely to reinforce, rather than substitute for, the financial stability impact of an LVR policy. For example, some current borrowers have LVRs below 80 percent, but would struggle to service their loans if interest rates rose sharply or they suffered a surprise reduction in income (see section 3).

During a prolonged boom in house prices (as in NZ in the last 5 years), the degree of constraint exerted by a DTI policy would remain substantial, even on existing homeowners. In contrast, LVR policy can have less impact on existing homeowners after a sharp increase in house prices as they would have accumulated substantially more equity. This makes DTI policy a more effective anchor for debt levels during a prolonged house price boom.

It is important to note that a DTI policy would not seek to eliminate mortgage defaults. Individuals in an economy will always be responding to fluctuations in income, and taking the risk of shocks into account when making borrowing decisions. This is expected to result in a non-zero number of defaults in normal times and (even with a DTI policy) some rise in defaults during downturns. A DTI policy is predicated on the view that if enough homeowners have high debt relative to their incomes and house values, and get a negative surprise (e.g. a fall in house prices or incomes) simultaneously, the impact on the wider economy and financial stability could be severe, and that individuals generally do not take this systemic risk into account. Similarly, individual lenders may not take the risk of a systemic downturn sufficiently into account when setting lending policy. While this exposes both borrowers and lenders to a greater risk of loss, those losses occur infrequently, and not all of the economic consequences of a mortgage customer getting into difficulties fall on the lending bank. For example, there is evidence that high-DTI loans exacerbate the risk of a boom-bust cycle in consumer spending or construction, and an individual bank would have limited reason to internalise the resulting increase in system-wide risk.

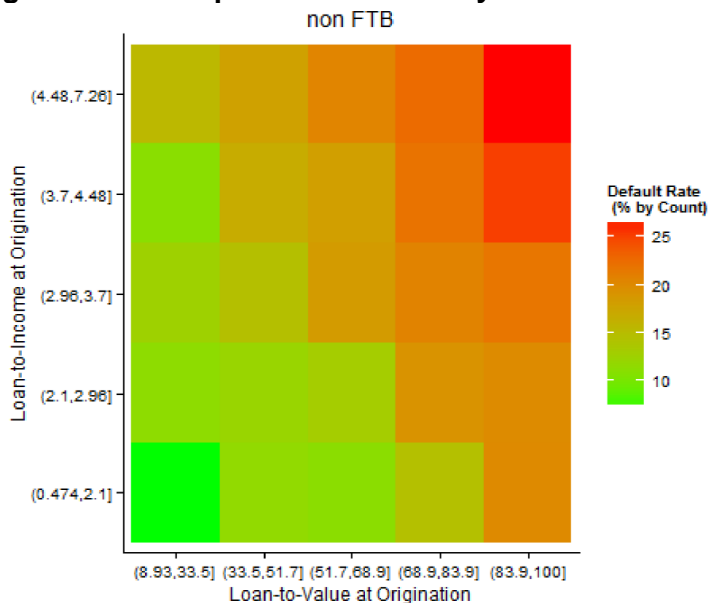
The GFC shows these channels are important for mortgage default...

DTI policies of the sort we describe were not in place in many countries prior to the GFC. The DTIs that were available to individual borrowers were constrained by individual bank lending decisions, which would have varied over time (see section 3 for NZ evidence) and across countries. However, it is not easy to obtain objective measures of those lending standards and study their impact.

One study (Mian and Sufi (2009)) exploits variation across US areas (zip codes) and shows that areas that were reliant on subprime lending (which was hard to obtain in the mid 1990s, but became much more available in the years leading up to the GFC) appeared to experience the biggest increase in credit supply over that period. Those areas had relatively large increases in mortgage credit (despite relatively low income growth) and the biggest increase in mortgage defaults during the economic downturn that followed. In other words, the sharp increases in credit availability (relative to income) during the boom appeared to worsen mortgage defaults after the downturn. This suggests regulatory standards that prevented the sharp easing in lenders' standards would have helped alleviate the severity of the crisis.

More generally, empirical studies of severe housing market downturns support our view in Figure 1 that both ability to pay (represented by DTI) and LVR are important determinants of loan default. Factors determining ability to pay – such as regional unemployment, loan-to-income ratios and interest rate structure – played a significant role in the rise in mortgage defaults after the GFC in Ireland and the US. Figure 2 below (from Hallissey, Kelly and O'Malley (2014)) shows how default rates rose for owner occupiers (excluding first home buyers) as the initial LVR and loan to income ratio of the borrower rose.¹ This suggests that debt serviceability policy would tend to complement LVR limits in reducing credit risk on mortgage lending.

Figure 2: Heatmap of default rates by LVR and LTI for Irish borrowers



Hallissey, Kelly and O'Malley's results suggest that first time buyer default rates are lower than those for other owner occupiers. Kelly, O'Malley and O'Toole (2015) confirm this (controlling for other factors like LVR and loan to income). Interestingly, this is even after controlling for borrower age, which suggests the effect is not a result of first time buyers purchasing at an earlier stage of life, and then experiencing faster income growth than other owner occupiers.

¹ See also Kelly R and T O'Malley, "A Transitions-Based Model of default for Irish Mortgages," Research Technical Paper 17RT14, Central Bank of Ireland 2014; and Gerardi K, K Herkenhoff, L Ohanian & P Willen (2015) "Can't Pay or Won't Pay? Unemployment, Negative Equity, and Strategic Default" NBER Working Papers 21630.

Investors have a greater tendency to default even if they are able to service loans, making investor default rates more sensitive to LVR than for owner-occupiers (see RBNZ (2016)). However, there is also evidence that ability-to-pay factors play a strong role in driving investor default rates, and it is likely that the income servicing investor loans is more correlated with the value of the underlying security. Kelly and O'Malley (2014) find that investor default rates are highly sensitive to regional unemployment rates in Ireland. Kelly and O'Toole (2016) find that the size of debt payments in relation to rental income is a strong predictor of post-GFC default rates on buy-to-let loans in the United Kingdom.

There are some institutional differences between Ireland and the US and the NZ economy, but we are not persuaded that this makes the lessons we draw in this section from US and Irish evidence irrelevant to New Zealand. For example, some US states had non-recourse lending which allowed homeowners to walk away from their home rather than continuing to pay the mortgage. However, this was only true in limited parts of the US and not true in Ireland. Origination standards in the US before the financial crisis were probably significantly worse in some ways than in New Zealand today, perhaps partly because the way in which risky mortgages were securitised led to them being passed to owners who were not aware of the risks. However, securitisation was a much smaller (although growing) proportion of the Irish mortgage market prior to the crisis (see Godfrey 2011). Finally, while New Zealand does not have a class of lending described as 'sub-prime', as shown in the next section, it is clear that debt service ratios have become substantially larger for some NZ borrowers than would be allowed in a prime loan in the United States.

...and for the impact on the wider economy.

The financial system is also indirectly exposed to risks associated with high-DTI households. The consumption of indebted households tends to fall sharply in response to shocks to income or wealth, as attempts are made to continue servicing loans and precautionary saving increases (see Thornley (2016)). Weak demand can be exacerbated by reduced availability of credit as banks tighten lending standards. A number of country studies have found that sharp falls in consumption by indebted households reinforced the economic impact of the GFC. For example:

- US households in the GFC with higher-LVR mortgages reduced their spending by more than the less indebted households (Dynan, 2012).
- In Japan, sizable household debt depressed consumption following the financial crisis in the 1990s (Ogawa and Wan, 2007).
- In Denmark and the UK, households with DTI ratios above 2 lowered their spending after the GFC by more than the less indebted households (Bunn and Rostom, 2014, and Andersen et al, 2014).

These declines in spending can exacerbate economic downturns. In Ireland, private consumption fell sharply as housing wealth contracted with retail sales declining by nearly 20% year on year by early 2009. This contributed to widespread defaults on business loans. By 2013, more than 40% of SME loans were in default (Central Bank of Ireland, 2017).

Increased house listings by indebted households could also amplify a downturn in the housing market. In other words, homeowners that are having difficulty servicing the mortgage can sell some or all of their properties. This may help them to avoid mortgage default. But by exacerbating the decline in house prices, these forced sales will increase stress on other borrowers. This is a particularly relevant risk for loans to investors, who often own multiple properties and are likely to be more ruthless in selling properties during a downturn. Gao et al (2016) find that US regions with a greater share of investor purchases

during the pre-GFC housing boom experienced significantly more pronounced house price declines in the subsequent bust.

Another economic cost from falling house prices is that, even without substantial mortgage defaults, negative equity can prevent homeowners from shifting for a better job. A recent study demonstrates this with US data from the GFC and explains the intuition further (see Brown and Matsa (2016)).²

DTI policy appears to restrain credit growth.

International studies including Kuttner and Shim (2013) and Cerutti et al (2015) have looked at the effectiveness of macroprudential policies such as DTI and LVR limits in restraining credit growth. Generally these studies, including those two and most of those discussed in Cerutti et al's summary of the literature, appear to find that LVR and serviceability limits both have significant impacts on credit growth. Since they reduce credit availability to relatively high risk borrowers, this is consistent with the policies also reducing the riskiness of household balance sheets. Kuttner and Shim interpret their own findings as follows:

“changes in the maximum debt-service-to-income ratio appear to be more effective than adjustments to the maximum loan-to-value ratio. One possible explanation is that even with an unchanged loan-to-value ratio, house price appreciation enables a larger volume of borrowing... For this reason, capping the debt-service-to-income ratio may be the tool of choice for slowing credit growth during housing booms.”

Q1: Do you have any comments on the evidence that high DTI borrowers are more susceptible to mortgage default and consumption stress? Are there other relevant studies, or other relevant channels through which a DTI policy would influence financial stability?

3. DTIs and house prices in New Zealand are high and rising

Housing imbalances are unusually large in New Zealand, and do not appear to be contained.

House prices in New Zealand are high relative to incomes, particularly in Auckland where the ratio is now one of the highest seen internationally. With house prices stretched, there is a risk that prices could fall sharply in the future. Recognition of this risk led the Reserve Bank to implement restrictions on LVRs for new borrowers in 2013 (with adjustments to the restrictions in both 2015 and 2016). The LVR restrictions have helped to protect banks' balance sheets from a significant increase in credit losses during a housing market downturn.

However, the persistence of high house prices means that many borrowers are taking out loans at elevated multiples of income in order to purchase houses. All else equal, high DTIs increase the probability of loan defaults if adverse economic conditions arise by reducing the financial buffers that borrowers have available to cope with such circumstances.

If house prices accelerate again, it may well happen in an environment where (as in recent years) interest rates remain low because of weak global economic growth and inflation. In this event, house prices would be rising even further (relative to income), stretching affordability even further. In the Reserve Bank's view, this would create risks of an eventual downturn similar to that seen in countries like the US and Ireland during the GFC.

² <http://www.nber.org/papers/w22929.pdf>

The Reserve Bank considers that housing demand and supply will eventually be brought into balance, partly because rising house prices will stimulate housing supply. Work to reduce the costs and uncertainty associated with housing construction by local and central governments should ultimately make it possible to build enough new homes to put downward pressure on house price to income ratios, particularly in Auckland. LVR and DTI restrictions do not seek to 'solve' the current housing imbalances, but they aim to make banks and borrowers more resilient to falling house prices or an economic downturn.

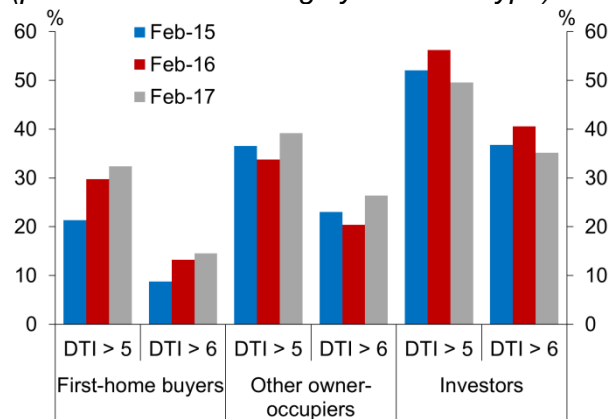
Mortgages have grown substantially relative to income.

Coleman (2007) provides some interesting historical perspective on the size of loans available to borrowers in NZ over time. Prior to the mid-1980s deregulation, bank mortgage providers faced regulations that limited the size of mortgage repayments relative to income. After those rules were eliminated, Coleman reports that banks maintained similar internal rules: for example a major bank required customers to be able to "meet minimum monthly payments" using "30% of sole income or 25% of joint income" using a 20 year table mortgage. By around 2000 these rules had been eased so that some customers could borrow 33 percent of joint income, or slightly more if they had a large deposit. These rules, alongside declining mortgage rates, meant that the maximum loan available to customers (relative to their income) rose substantially. Coleman suggests that a household earning \$50,000 might have been able to borrow around \$79,000 in 1989, but \$191,000 in 2005. In DTI terms, the maximum DTI permitted had risen from around 1.6 to around 3.8.

The internal models used by banks to originate mortgages in recent years generally involve computing a measure sometimes called 'net income surplus' (NIS), which is a measure of the funds available to the customer after paying tax, the mortgage, and other essential expenditure needs. The mortgage costs are typically computed assuming the mortgage is being repaid over 30 years (even if the customer is interest only initially) and with some allowance for rising mortgage rates, and there are a variety of methods used to evaluate the essential expenditure needs of the customers. As can be seen looking at the mortgage calculators on the websites of the major banks, these methods can allow customers (especially those with large incomes and few dependents) to borrow larger multiple of incomes than Coleman reported in 2005. At the time of writing, some mortgage calculators suggested a couple earning \$200,000 in total with no dependents could borrow around 7.5 times income (\$1,500,000). If they were making 30 year repayments and using a 5 year fixed rate (currently just over 6 percent), their mortgage payments would consume around 54% of gross income. This compares to a maximum mortgage payment to income ratio around 43% for conforming or 'prime' mortgage lending in the United States. While the mortgage calculator may not exactly align with bank lending policy, the data collected by the Reserve Bank suggests some customers are obtaining DTIs around this level.

Of course, many customers are on lower incomes which permit borrowing lower multiples of income, and many customers do not borrow the maximum amounts permitted by banks. Nevertheless, the proportion of mortgage customers borrowing large multiples of income seems to have been rising over the last couple of years. This is evident in a 2014-2017 data series the Reserve Bank has been collecting from the 5 largest banks (Figure 3). There is indirect evidence of DTIs rising over a much longer period: New Zealand's aggregate mortgage debt to income has risen substantially (see RBNZ Household Wealth Statistics for example) at the same time that the home ownership rate has been declining, concentrating that debt in a smaller portion of the population.

Figure 3: Share of new lending with high-DTIs
(percent of new lending by borrower type)



Source: Private reporting from the five largest banks.

The expansion in maximum loans has been coincident with an increase in house prices, so that the balance sheet of the household sector as a whole does not look particularly weak (total household debt is currently only around 23% of the value of the housing stock). However, as noted above this debt has become concentrated into a smaller proportion of households, with many recent borrowers having LVRs near 80% and high DTIs. If the level of house prices and credit proves unsustainable, the ‘paper’ wealth from rising prices can erode quickly as house prices fall, particularly for borrowers with much higher than average LVRs.

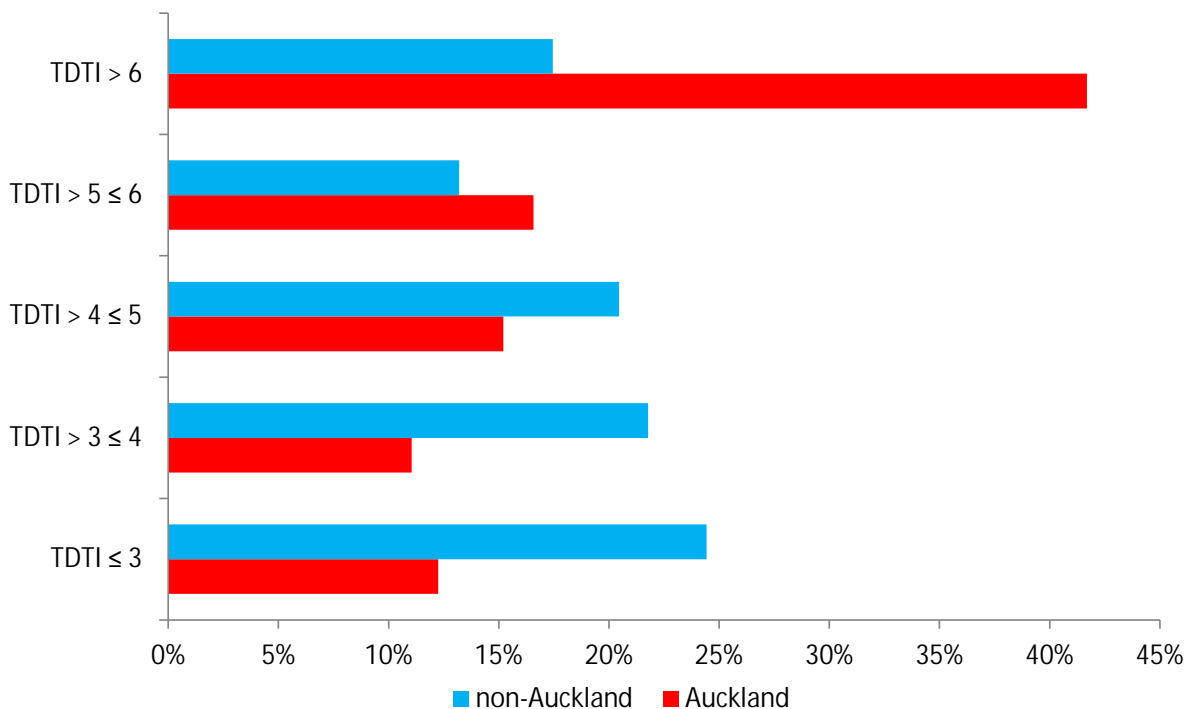
DTIs have risen alongside a trend decline in interest rates. In a low interest rate and inflation environment, the initial payment on a mortgage is made significantly smaller and this might be seen as a reason to be sanguine about rising DTIs. However, interest rates are likely to rise from their current levels at some point. Also, low inflation means that the affordability pressures of a mortgage persist for longer (since nominal income doesn’t rise at the same rate in a low inflation environment).

Starting in October 2016, the Reserve Bank has begun to obtain more detailed data from banks showing the total debt to income ratios (TDTIs) of borrowers with a clearer split between investors and owner occupiers, and between Auckland and non-Auckland borrowers. This data is still preliminary, and we are continuing to engage with banks to understand their reporting standards and improve the consistency in data methodology. TDTI should include the debts of borrowers at other financial institutions, but some banks have difficulty reporting this comprehensively. Some banks also report that they do not necessarily capture all sources of borrower income if the borrower has demonstrated enough income to pass the servicing test. Also, some banks have system problems which mean they are unable to capture all the income details used to pass the servicing test when calculating TDTI. These factors appear to lead to artificially high results. Other borrowers may not have enough income to service the mortgage themselves, but have sufficient mitigants (e.g. a guarantee and support from their parents) that the bank is willing to lend. As our data is improved and we understand cases like the last one better, the share of high-DTI lending in the data is likely to decline. To some degree, these issues may disproportionately affect investor lending, since the systems used to store data on those customers are often more complicated (reflecting the complex relationships that sometimes exist within groups of related borrowers). However, we are confident in the conclusion that New Zealand DTIs are relatively high, and the relative shares of the different sorts of buyers discussed above, are likely to remain broadly intact. Given the international evidence in the previous section that high DTIs are likely to increase default risk in a downturn, we consider this a policy concern.

High DTI loans are most common in Auckland and for investors

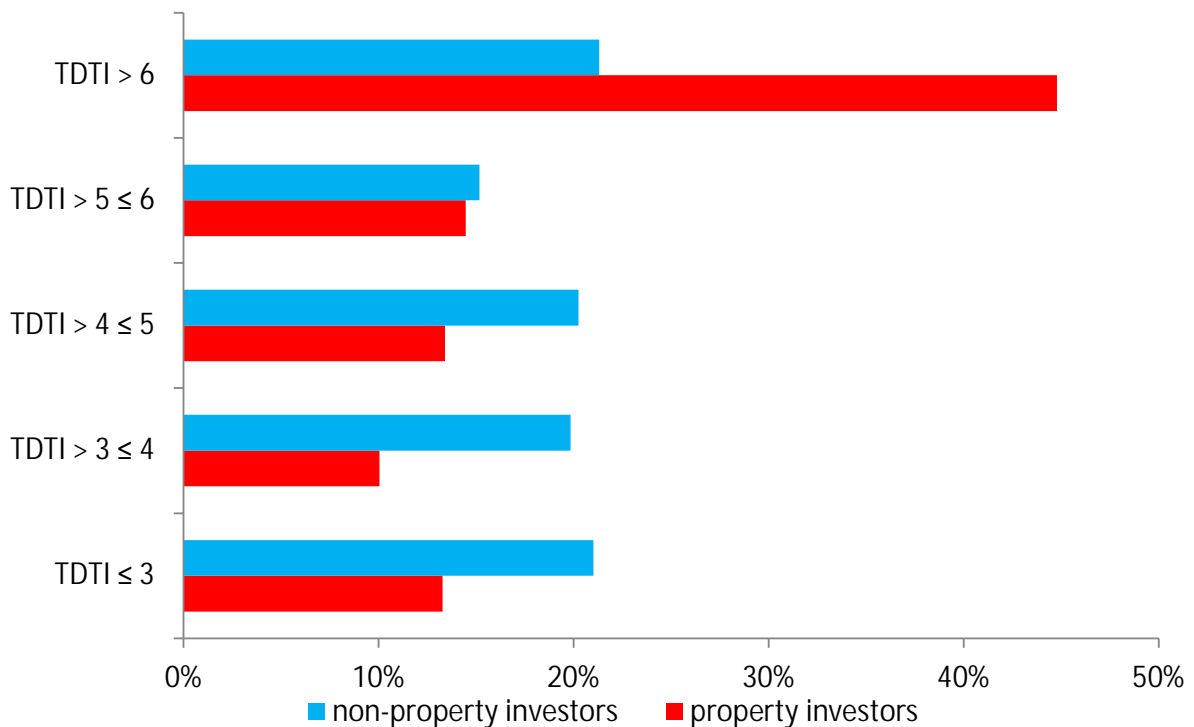
Data suggest that DTI levels are significantly higher in Auckland than elsewhere. Data for New Zealand's five largest banks suggested that, in the three months to January, nearly 60% of the new lending in Auckland involved a DTI ratio of greater than 5, while it was lower than 30% of the new lending for other regions on average (Figure 4). While both of these figures are likely to be somewhat overstated for the reasons discussed above, this should not affect the relative position of Auckland vs non-Auckland borrowers particularly. A higher average DTI ratio for Auckland reflects a greater increase in the house price-to-income ratio over the past couple of years, primarily owing to stronger growth in house prices in Auckland than in other urban centres.

Figure 4: DTI Share of commitments values, Auckland vs. non-Auckland, Nov to Jan 2017



A decomposition of the data by buyer types shows that property investors typically have a higher DTI than owner occupiers without an investment property. In the three months to January, about 60% of the new property investor lending at the five major banks involves a DTI of greater than 5, more than the 37% for owner occupier lending (Figure 5). One reason why investors generally have a higher DTI is that they have more free cashflow on average at any given DTI multiple (partly due to higher incomes), making high DTIs somewhat more sustainable for investors. However, banks face some additional risks lending to investors relative to owner occupiers. For example, their income is likely to be more correlated with the value of their house (if the house cannot be tenanted because of weak demand, it is also likely to be difficult to sell).

Figure 5: DTI Share of commitment values by buyer type, Nov to Jan 2017



New Zealand house prices are abnormally high.

High DTIs are a bigger concern, especially in terms of the potential losses for banks, if there is a significant probability that house prices will decline sharply. In this regard, it is also worth noting that a range of measures indicate that New Zealand house prices are significantly inflated relative to normal valuation indicators. For example, OECD data indicate that, relative to their long-term averages, New Zealand has the highest house-price-to-rent ratio, and the second highest house-price-to-income ratio among the OECD economies.³ IMF data show that New Zealand had the third highest real increase in house prices among 64 countries in the year to June 2016.⁴ The absolute level of house prices in Auckland relative to income, shown in Figure 6 below, appears to be higher than a similar ratio for similarly sized Australian and US cities. Other NZ cities also have high price to income ratios relative to cities of similar size in the chart. This reinforces our view that current prices could prove unsustainable, with factors like additional supply of housing and higher mortgage rates having the potential to reduce prices in the future.

³ OECD, 2016 'Focus on House Prices', and Global Economic Outlook, June 2016.

⁴ See IMF 'Global Housing Watch' November 2016.

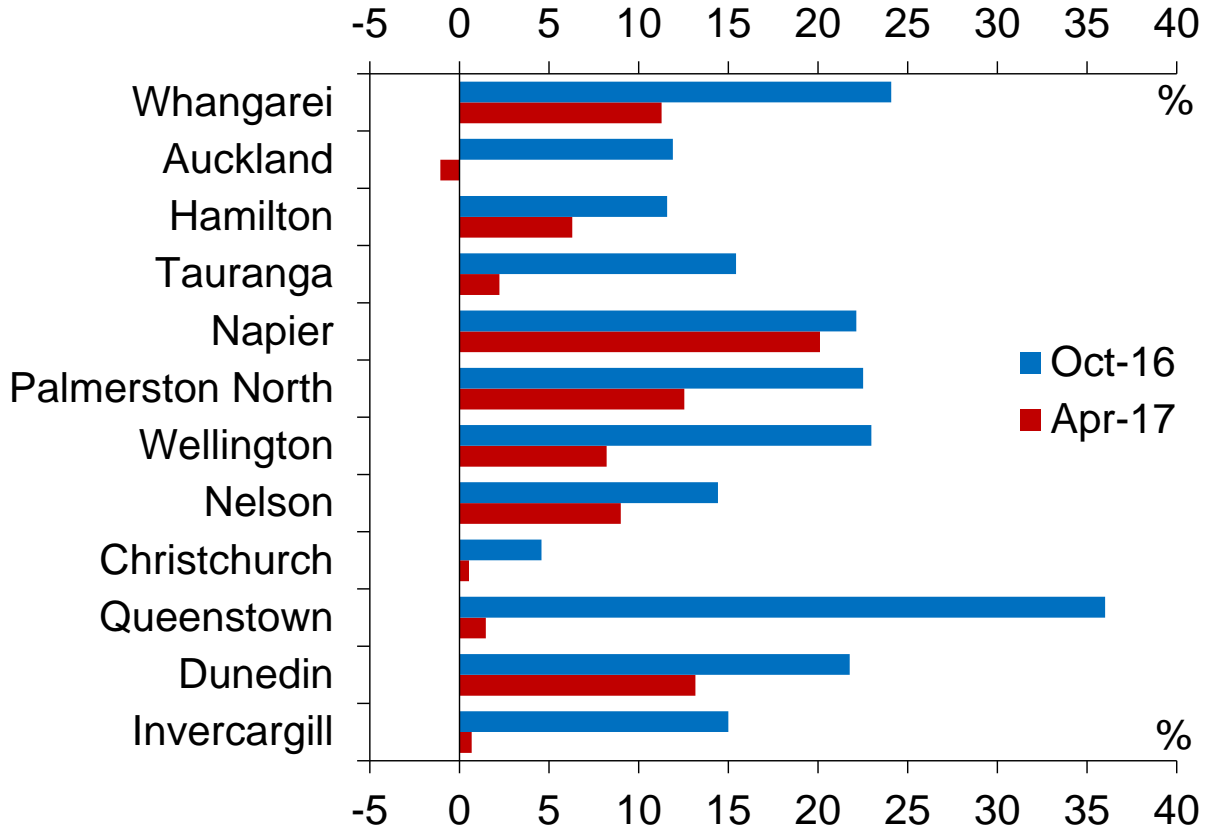
Figure 6: House price to income ratios and population, US, Australian and NZ cities

blue = US, yellow = Australian, red = NZ

Sources: Demographia, Statistics NZ, REINZ, RBNZ calculations

Note: These house price to income ratios use different data to some other comparative studies, but this is not expected to affect the general pattern.

As noted earlier, New Zealand house price inflation has eased recently (figure 7), for a variety of reasons including tighter LVR restrictions, rising mortgage rates, and the level of prices making house purchasing unaffordable for prospective buyers. Based on the April 2017 data, average house prices have barely risen since August 2016. For this reason, as noted earlier, the Reserve Bank would not implement DTIs in current market conditions even if they were available in the macroprudential policy toolkit.

Figure 7: Regional House Price Growth

Note: 6 month change in REINZ house price indices, annualised and seasonally adjusted.

Current DTIs could lead to mortgage stress

Table 1 shows the impact of higher mortgage rates on the cash flow of high-DTI (>5) owner occupiers.⁵ At mortgage rates around current levels, debt servicing consumes around 40 percent of the before-tax income of a typical high-DTI owner-occupier, rising to around 50 percent if mortgage rates rise to 7 percent. These debt servicing ratios leave very limited financial resources for expenditure on other items, increasing the risk of a large cutback in expenditure, forced sale, or loan default. In a scenario where mortgage rates rise to 7 percent, a typical high-DTI owner-occupier is estimated to have residual income (after tax and mortgage payments) that is only just above our estimate of essential expenditure. If mortgage rates rise to 8 or 9 percent, a typical high-DTI first-home buyer would have residual income below essential expenditure.

⁵ Owner occupiers with reported DTIs above 8 are excluded as this data appears unreliable. A box in the May 2017 *Financial Stability Report* expands on this analysis.

Table 1: Debt servicing ratios and residual income of high-DTI owner-occupiers (borrowers with DTI between 5 and 8)

	First-home buyer	Other owner-occupier
% of total mortgage lending since October 2016	5.7	15.8
Debt	584,900	584,200
Income (average, before tax)	97,200	97,400
Debt servicing ratio (average, % of before tax income)		
5.0%	39	39
6.0%	44	43
7.0%	49	48
8.0%	53	53
9.0%	58	58
Residual income (average, after tax and debt service)		
5.0%	36,400	39,000
6.0%	32,000	34,600
7.0%	27,300	29,900
8.0%	22,500	25,111
9.0%	17,500	20,000

Source: Debt-to-income returns from 5 major NZ banks, average over December quarter 2016.

Note: The residual income cells are shaded as follows: Green = covering over 125% of modelled essential expenditure; Yellow = covering between 100% and 125% of essential expenditure; Red = not covering essential expenditure. See main text for details on how essential expenditure was modelled.

Our assumed essential expenditure for high-DTI households is approximately \$23,000, based on lower quartile spending on recurring items in the Household Economic Survey.⁶ Although some low income high-DTI households might have expenditure below these levels, we believe this a conservative estimate. For example, NZ superannuation payments provided to a retired couple with no other income amount to approximately \$31,000 per annum, after tax. In the event of large increases in debt servicing costs, many mortgaged households may be stretched to meet their costs of living, particularly if they have significant non-essential spending that cannot be scaled back quickly.

Another piece of circumstantial evidence is to look at self-declared measures of mortgage stress at a household level. While analysis of this sort has not been conducted for New Zealand, as far as we are aware, it may be possible to do so in the future using surveys like the HES. In the meantime, origination policies in New Zealand appear broadly similar to Australia, and some survey evidence suggests that high mortgage debts are already having a significant effect on Australian households. According to Digital Finance Analytics (DFA), reported mortgage stress and delinquency rates in Australia have increased over the past year, reflecting higher mortgage debts relative to incomes and a small rise in mortgage interest rates. DFA currently suggest around 23% of households are in at least mild stress,

⁶ Our estimates take the same approach as Skilling and Dunstan (2015). Lower quartile spending on recurring items was estimated for different family types and income levels as a proxy for essential expenditure. Recurring items included food, clothing, healthcare, transportation, communication, energy, insurance, personal care, certain services and some recreation. The estimates used for Table 1 are the average essential expense for households with a similar income level.

which they define as customers “reprioritising expenditure, borrowing more on loans or cards, and refinancing”. This supports our view that significant volumes of mortgages are being originated at income multiples that would cause customers difficulty if interest rates rose from current levels.

Q2: Do you agree that the current levels of debt (relative to income) that some borrowers are able to borrow risk putting them under pressure, especially if interest rates rise? Why are the DTIs achievable in New Zealand apparently higher than in other markets like the UK?

4. International experience and advice

DTIs and similar tools are becoming more common internationally.

New Zealand is not alone in confronting the impact of very low global interest rates on real estate markets. The European Systemic Risk Board (2016)⁷ recently warned eight European countries about this concern, supporting limits on LVR and DTIs.

Limits on DTI or loan serviceability are becoming increasingly common internationally (table 2). Both the UK and Ireland have recently applied a limit on the proportion of loans that can be originated by banks above a specified DTI threshold. Restrictions on debt servicing burdens are also increasingly common. To date, most tools have been applied either to owner-occupiers specifically or to all mortgages (we are not aware of instances where such instruments have been used to target investors only, though some countries like the UK have issued specific permanent rules around origination of investor mortgages).

A number of countries have introduced guidance for banks on mortgage origination standards related to serviceability, including Australia. These guidelines, discussed further in the next section, tend to influence lending standards at a more granular level than the debt serviceability tool that the Reserve Bank is proposing to add to the MoU.

⁷ The ESRB is responsible for macroprudential monitoring within the EU. It issues warnings to countries where it considers system risks are building up and, if necessary, makes recommendations for measures to be taken to deal with these risks.

Table 2: Selected interventions related to mortgage serviceability

	Country	Limit	Coverage
Debt-to-income limits	Ireland	No more than 20% above 3.5	Owner-occupiers only
	United Kingdom	No more than 15% of lending above 4.5	Owner-occupiers only
Other examples: Singapore.			
Debt service ratio limits	Canada	Maximum around 40% to qualify for government insurance.	All mortgage lending receiving government insurance
	Hong Kong	Limit of 50% for owner-occupiers and 40% for investors	Bank mortgage lending
Other examples: US, Korea, Israel, Lithuania, Estonia.			
Prudential practice guide	Australia	Minimum standards for origination tests (eg assumed interest rate, living expenses).	Bank mortgage lending
Other examples: Switzerland, Germany, UK.			

International agencies have also expressed support for the idea that DTI restrictions could be a useful policy tool in New Zealand, especially if housing imbalances worsen. This includes the IMF (2017) FSAP review of New Zealand and the OECD⁸.

5. Alternatives to DTIs

In this section, we describe alternative policies that could potentially achieve the same desired outcomes as a DTI policy.

Interest rates

The Reserve Bank can lean against excessive exuberance in the housing or other asset markets through raising interest rates. However, monetary policy is primarily directed at the medium term stabilisation of inflation. While there may be circumstances in which monetary policy can be adjusted in support of financial stability (Spencer (2014) notes it may be possible to run slightly tighter policy in response to asset price concerns if inflation is near the target), this will often not be sufficient to materially reduce financial stability concerns. In recent years, for example, this has meant interest rates needed to be low to help support growth and bring inflation back up towards the price stability target. This has been a factor behind rising asset prices, but pushing interest rates higher to avoid this would have compromised the price stability objective.

Capital requirements

The Reserve Bank is currently reviewing the capital requirements of locally incorporated banks, including the role of cyclical buffers like the countercyclical capital buffer, which is already a part of the macroprudential toolkit. Capital requirements are a central and permanent part of the Reserve Bank's prudential policy framework. They aim to ensure that individual banks have sufficient financial capacity to absorb losses, thereby reducing the

⁸ OECD economic outlook (2016) discussion of New Zealand: "Additional macroprudential measures, such as debt-to-income restrictions, may be required if rapid price increases persist".

probability or extent of bank failures. However, even if banks don't fail, large numbers of borrowers may still get into financial difficulty in the event of a housing downturn (see section 2). Income shocks (or surprise rises in interest rates) may force borrowers to cut back on consumption and/or sell property, which in turn may worsen the economic situation and the health of the financial system. As mortgages get larger relative to income, these risks grow.

As part of its ongoing monitoring of the financial system the Reserve Bank regularly considers the potential use of macroprudential overlays such as the countercyclical capital buffer or a buffer specifically targeted at residential mortgages. Because the impact of a DTI policy is broader (as discussed above), we think such a capital overlay would have the potential to complement a DTI limit, rather than being a direct substitute.

Loan to value ratios

LVR and DTI limits appear to be complementary policies, as they are indicators of different aspects of the riskiness of a borrower (see section 2). LVR limits reduce the risk of banks facing a loss upon default. Conversely, DTI limits reduce the likelihood of borrowers defaulting or needing to sharply reduce their consumption during an economic downturn. DTI and LVR limits reduce the potential contagion dynamic where forced sales can push house prices down, putting more borrowers into negative equity and causing further forced sales. Furthermore, DTI limits would have a more durable effect than LVRs in a rising market since rising house prices can reduce the LVR of existing owners and thus make LVR restrictions less effective over time.

Considering current circumstances, the LVR restrictions remain an important tool, but are already quite tight. In our view, it makes little sense to push harder on the LVR risk dimension when the other key risk dimension – DTIs – is unconstrained. With new mortgages originated at more prudent LVRs, but at increasing DTI levels, the Reserve Bank considers that it would be more efficient and effective to respond directly on DTIs, should a further macro-prudential tightening be warranted. Introduction of a DTI limit could be an appropriate time to ease LVR restrictions somewhat (in some circumstances this could lead to policy being better targeted at overall risks). However, as stated, the Reserve Bank does not currently intend to introduce a DTI limit unless housing risks become more acute.

More detailed prudential oversight

An alternative approach to LVR and DTI limits, used by some overseas regulators, is to create a more detailed standard for prudent lending practices. Like LVRs and DTI limits, a prudential practice guide provides an overlay on bank's self-discipline, but does so by providing guidance on all aspects of the origination decision (e.g. prudent assumptions about living expenses and potential future increases in interest rates). Regulators can then benchmark banks against the guide and provide feedback on aspects that they consider need to be strengthened (see Richards 2016).

A prudential practice guideline could, in theory, be calibrated to have similar implications for credit availability to a DTI limit. A key difference is that this approach requires a fairly detailed and regular collection of information on bank origination policies, with the regulator needing to have an ability to require specific changes where it feels particular banks are not originating loans sufficiently closely to the guidance provided. In contrast, a DTI policy provides a control on the overall results of bank origination policies, while leaving banks to make more of the decisions about how to implement that control. A DTI policy is therefore likely to require less detailed rules on origination standards and less supervisory resources to monitor compliance.

Alternative serviceability measures

While other sorts of serviceability restrictions (such as a limit on debt servicing costs as a ratio to income (DSR)) are possible, they are more complicated and may require additional supporting rules and data collection. In the case of a DSR, for example, it would be necessary to specify how interest rates should be assumed to evolve (otherwise when interest rates were temporarily very low the rule would allow very large loans that might be unaffordable if interest rates later rose). While the Reserve Bank suggests the MoU could be written in a way that would allow 'serviceability restrictions', which would include DSRs as well as DTIs, as outlined in the next section we think DTIs are the best compromise between effectiveness and simplicity.

Q3: Do you agree with our assessment of other possible policies that are under the Reserve Bank's control, or do you think one or more of them could be preferable to DTI limits? Are there other policy options under the Reserve Bank's control that we haven't listed that could be relevant?

6. How DTI limits would work

DTI data are being collected and refined.

The Reserve Bank has begun to collect data on the recorded incomes of mortgage customers and their loans (in relation to their income). As described above, banks assess borrower income as part of a loan application for both their own internal credit risk management and product suitability tests. The concept of borrower income should only include components that can be expected to reoccur. For example, wage or salary income from a permanent job would be likely to be fully admissible into the 'income' data being used to assess the serviceability of the loan. Overtime income or income from a small business would have to be assessed as to how reliably it had reoccurred in the past. In practice this could lead to income from these less certain sources being counted with a 'haircut' that should reflect its future reliability. The exact nature of these haircuts and policies may vary from bank to bank, so that the measured income for a particular household may vary depending on the bank. However, banks need to estimate likely future borrower income in a prudent way in order to protect them from the risk of mortgage default, and to ensure that the mortgage product is suitable for the consumer and is unlikely to cause them to suffer financial hardship (see the Responsible Lending Code, Section 5).

The current definition of income we have asked banks to report to us essentially uses banks' own policies about which income is sufficiently documented and reliable to be counted when doing a serviceability assessment of the borrower. However, as we engage with banks about their initial data returns, we may find areas where greater standardisation is desirable, and tighten the definition as a result. As noted above, there are also measurement issues with the current dataset, and measured DTIs may reduce in coming months as banks improve their systems to more accurately record borrower income, even in complex cases.

This dataset could be used to monitor a DTI restriction policy

A DTI restriction would likely take the form of a limit on the total debt of the borrower as a ratio to gross income (TDTI). The 'total debt' of the borrower would include other debts at the bank and other material debts, such as mortgages on other properties at other banks. Banks would be expected, as now, to inquire as to the other debts of borrowers and borrowers would be expected to provide this information to the bank. The Reserve Bank might also

periodically scrutinise the approach taken by banks to verify this information when supplied by the borrower.

The DTI limit would be expected to be a speed limit, as with LVRs, so that banks are able to deal with borrowers that appear to be special cases. This approach has been used with DTI limits in countries including the UK, Ireland and Norway, and also with LVRs in New Zealand. This allows the handling of special cases without the need to write a multitude of complicated exemptions to the policy. However, the Reserve Bank would also expect to apply a range of exemptions, as with LVR restrictions, that would be designed to eliminate certain potential unintended consequences of the policy (for example, to exempt loans that are for the construction of new dwellings).

The limit would apply to standard residential mortgages (as defined in Reserve Bank's capital adequacy framework). This includes some loans secured by residential mortgage that fund businesses, but not some larger business loans (e.g. a very large loan where the owner's home is used as security but is not the key factor behind the lending decision). It does not include reverse mortgages.

DTI limits would have a more durable impact to LVRs, and complement them.

The effect of the policy would be to reduce the size of the loans available to some bank customers. During a prolonged boom in house prices (as in NZ in the last 4 years or so), the degree of constraint exerted by the policy would remain substantial, even on existing homeowners. In contrast, the LVR policy has less impact on existing homeowners after a sharp increase in house prices (as they have accumulated substantially more equity). This makes DTI policy a more effective anchor during a prolonged house price boom.

The DTI limit would be expected (as discussed above) to limit the financial instability resulting from a sharp fall in house prices, by reducing the number of borrowers that got into financial difficulty. It would complement LVR restrictions, since LVR is a different indicator of borrower risk, which is more related to the extent of the loss that the bank may take if the borrower gets into severe financial difficulty.

The DTI limit would be expected to apply to investors and owner-occupiers. This is not the case in some countries (such as the UK and Ireland) where 'buy to let' loans are a separate product that are not subject to DTI restrictions (but may be subject to other strict prudential rules). The 'residential mortgage' asset class in NZ includes both owner occupiers and households that own investment properties, reflecting the fact that banks tend to portfolio-manage these loans, as well as the high prevalence of cross-collateralisation and grouped borrowings involving both owner-occupied and investor housing. Given it is possible for investors to get into financial difficulty when borrowing at high DTIs, it seems reasonable to apply the rules to all residential mortgages.

Like LVRs, the DTI limit would be expected to be temporary, to deal with periods where housing credit appears to be creating unusual levels of systemic risk. It would be possible for LVR and DTI limits to be maintained more permanently, perhaps at a less binding level. Indeed, most countries that use these tools do not describe them as temporary. This could be considered in the future (e.g. in the 2018 review of the MoU on Macroprudential Policy). However, there would be some disadvantages – for example, permanent use of the tools would be more likely to lead to efforts to disintermediate lending or otherwise avoid the restrictions through new business models. For this reason, we assume in the next section that DTI limits would be introduced temporarily at a binding level when risks become clearly apparent.

Q4: If a DTI policy was used, what would be the challenges and issues that could arise in the detailed rules and (for lenders and the Reserve Bank) monitoring compliance with the policy?

Q5: Do you agree that a DTI policy (if implemented) should be broadly as described above (a speed limit, with similar exemptions to the LVR policy)? Are there other design options or additional exemptions (besides the suggestion described above for relatively inexpensive owner occupied homes) that would be worth considering?

7. One possible calibration and potential impact , including an assessment of costs and benefits

If DTI limits are added to the macroprudential toolkit, a hypothetical situation that could prompt their use, along with a possible calibration, is sketched in this section. This is to illustrate one possible use of the tool and undertake a cost/benefit assessment. However, the precise rules and calibration could be quite different if DTIs were actually used, depending on the particular circumstances. As noted above, a full consultation on the precise rules would be undertaken before DTI limits were put in place.

DTI policy could be appropriate if house prices rise sharply further

- In this section, we describe the possible use of a DTI tool in a scenario where house prices re-accelerate. Specifically, we assume house prices rise nationwide by around 15% in the year to December 2018. Interest rates are assumed to remain at their current level because of continuing weak inflationary pressure, and the share of mortgages originated at high DTIs stays the same. This would mean house prices would be rising even further (relative to income), having already reached overstretched levels.
- Ideally, as discussed above, a rule would be calibrated based on total debt (including mortgages at other institutions). We call this total debt to income (TDTI). If a rule based on total debt was not possible, investors (in particular) could avoid any restriction by borrowing at multiple banks.
- Currently the data suggest around 27% of lending is above TDTI 6 and around a further 13% is between TDTI 5 and 6. A rule that limited new lending to borrowers with total debt to income ratios above 5, to no more than 20% of new lending, would thus significantly reduce the amount of high TDTI lending that was possible, even assuming (as we do below) around a quarter of the high DTI loans in our data are reported erroneously at present. This is only an illustrative calibration, and any actual policy could vary from this. For example, the speed limit and level designated as 'high-TDTI' could vary based on the circumstances prevailing at the time, and the Reserve Bank's ongoing assessment of the TDTI data and market risks. As noted earlier, the rule could potentially take a different form (e.g. a limit on debt service ratios), but our current thinking is that a TDTI speed limit would offer the best trade-off between effectiveness and simplicity.
- Our quantitative analysis assumes that the current share of high-TDTI lending would be maintained alongside strong house price inflation. An alternative assumption of further increase in the high DTI share, consistent with the rise in TDTIs seen in recent years, would make the policy somewhat more binding and effective. The quantitative analysis also assumes that the high-TDTI share does not increase further in the absence of a TDTI policy.
- The Reserve Bank considers that an exemption to a TDTI policy that facilitated people becoming or remaining homeowners might not have a serious impact on the effectiveness of any policy, and could reduce the risk of the policy impeding first home buyers and labour mobility. For example, an exemption could allow homes to

be purchased for owner occupation if their value was below the 'cap' for Housing New Zealand's homestart programme (currently \$600,000 in Auckland, \$400,000 to \$500,000 elsewhere). This is the example we have modelled below, but there would be alternatives: for example, the policy could allow first home buyers slightly higher TDTIs. The aim would be to diminish the welfare costs of the policy, as well as recognising that first home buyers had relatively low default rates in the Irish downturn experience (see section 2)

- Even without an exception of this sort, it is worth noting that much less high TDTI lending goes to first home buyers than other owner-occupiers and investors – in general we would expect this group to be affected less by a serviceability policy.
- The remainder of this section considers the estimated impact of the policy and describes a framework for measuring whether a TDTI policy would offer net benefits.

Framework for cost benefit analysis

We have focused on measuring the following key costs and benefits:

- The policy is expected to reduce the risk of a severe housing crisis, and mitigate the impact of a crisis if one occurs.
- By limiting house prices when implemented, the policy will reduce GDP, principally through leading to lower consumption spending out of wealth.
- By stopping some borrowers from being able to transact, the policy prevents some people from buying property or undertaking other spending they would otherwise have undertaken. Most importantly, some people who wish to buy for owner-occupation would be unable to do so for a period.

For the reasons discussed in section 5, we do not explicitly measure the costs and benefits of alternative policies other than a DTI and the status quo, as we believe a DTI policy would be a more effective way to lean against the risk of a housing downturn in the circumstances described. This also reflects the role of this paper, which is to demonstrate that there is potential for a DTI policy to have net benefits rather than actually propose the imposition of one.

This exercise is somewhat similar to the international analyses of the costs and benefits of increasing capital ratios conducted by a global working group (BIS, 2010) and later similar exercises like that of Brooke et al (2015). There seem to be limited formal cost-benefit analyses of macroprudential interventions published to date, although there are some such as Bank of England (2014), and Arregui et al (2013) provide a conceptual framework which is also broadly consistent with our work below.

In order to analyse all 3 of the cost/benefit channels listed above, we have constructed a simple model of the constraints facing borrowers (both with and without a DTI policy) and how borrowers respond to those constraints (see box A). This provides an estimate of how many borrowers will be affected, which in turn helps us to gauge the potential impact on other variables like economic growth and the risk of a crisis.

Indicatively, our work suggests that around 2000 owner occupiers and 9000 investors might be prevented from purchasing each year (Table 3). As discussed in Box A, the relatively high number of investor purchases that are constrained reflects (i) a greater share of high DTI lending than for owner-occupiers (ii) more limited ability to claim exemptions. The policy would also likely constrain some of the 160,000 or so top-up loans that occur each year, and we estimate that around 14,000 top-up loans could be constrained (assuming that the limit binds roughly proportionately on top-ups and purchases).

Table 3: Impact of policy on number of house purchases

Buyer Type	Mortgage funded purchases	Of which high DTI	Of which prevented from buying
First Home Buyer	21,100	5,200	1,600
Other owner occ.	27,400	4,400	700
Investors	29,700	11,900	8,800
Total	78,200	21,000	10,400

Source: CoreLogic, Reserve Bank debt-to-income survey, staff estimates.

Note: Total number of mortgage funded purchases, and the split by buyer-type, is drawn from averages of CoreLogic data over 2016. The proportion of purchases at high-DTIs is from the Reserve Bank's debt-to-income survey, adjusted for estimated measurement error. See Box A for how the number of constrained buyers is estimated.

Box A: Estimating the impact of a hypothetical DTI policy

To support the cost benefit analysis, the Reserve Bank has undertaken detailed modelling of the impact of a DTI policy on the distribution of new lending. This provided a consistent framework to inform our estimates of the benefits of the policy in enhancing financial system resilience, and the potential costs of a policy in constraining housing market choices for some borrowers.⁹

Our main data source is the Reserve Bank's revised DTI dataset, which measures the number and value of commitments split by DTI bucket and buyer type. More granular data in the survey was used to (i) split out the value and volume of lending by LVR and region of collateral and (ii) estimate a high and low income for each bucket.¹⁰ We then generated simulated unit records for DTI and LVR (according to the number of borrowers and maximum/minimum for each bucket), and estimated debt, property values and cash flow based on the representative incomes. The resulting pseudo dataset facilitates rich modelling of the distributional impact of the DTI policy, in an environment that can replicate a range of stylised facts about new mortgage borrowers.¹¹

By construction the DTI policy would reduce the share of non-exempt mortgage lending at a DTI exceeding 5 to below 20%, compared to a raw high-DTI share of 45% currently. As shown in table A1, we believe that part of the reduction would come from loans that are erroneously measured as high-DTI, or will be exempt from the policy. Subject to large uncertainty bounds, we estimate that this would leave around 34% of current lending as genuine, non-exempt high-DTI loans. The remaining required adjustment in high-DTI lending

⁹ The Reserve Bank will continue to work on this model and will consider publishing the work at a later date. The model has some similarities to a Central Bank of Ireland study (Kelly, McCann and O'Toole (2015)).

¹⁰ This requires additional assumptions because we do not know how these additional variables are correlated with each other. For example, we assume that LVRs don't vary by region, income doesn't vary by LVR, and that incomes are a constant 40% higher for Auckland borrowers.

¹¹ By construction, the data matches the DTI distribution by buyer type, and individual correlations between DTI/buyer type and LVR, region and borrower income (see section 3 for a summary). For example, property purchases are significantly more expensive in Auckland and at higher DTIs, investors have significantly higher incomes than owner-occupiers, and first-home buyers in Auckland have significantly higher incomes than those outside of Auckland. The average property purchases of buyer types in and outside Auckland match CoreLogic data, and the differential between Auckland and rest of New Zealand borrower incomes matches evidence from the Household Economic Survey.

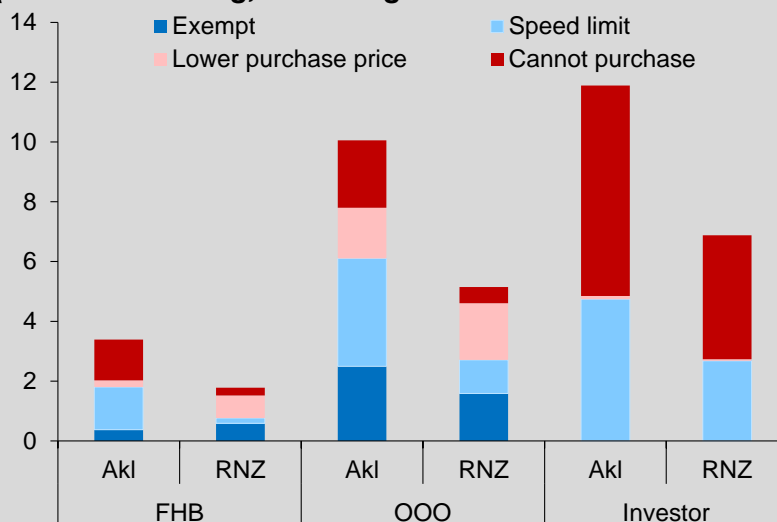
would partly be achieved by some borrowers lowering their DTI (eg by purchasing a lower value property). We estimate that around 16% of current mortgage lending (by value) is to borrowers that would not be able to purchase for a period under the policy (8 percent of loans by number).

Table A1: Categorisation of high-DTI borrowers under the hypothetical policy

Category	Assumption
Measurement error	Drop loans that appear likely to fail bank origination tests
Exemption	Exempt borrowers purchasing below \$600k in Auckland and \$500k elsewhere ¹²
Speed limit	Allocated according to cash flow within buyer types
Reduce DTI in response	Buyers can reduce property value by an average of 10%, and larger amounts for cheaper property
Unable to purchase	50% of buyers that are constrained are replaced by a low-DTI.

As discussed in section 3, most of the high-DTI lending is to borrowers that own investment property and/or property located in Auckland. Based on the above assumptions, figure A1 shows how different buyer types could be affected by the hypothetical DTI limit. Investors and Auckland owner-occupiers account for 72 and 23 percent of the lending in the “unable to purchase” category, respectively. As well as having a lower share of high-DTI loans, non-Auckland owner-occupiers are less affected as they (i) make greater use of the exemption for low value property purchases, and (ii) are better placed to substitute to lower value properties (Auckland first-home buyers already purchase properties well below the average value in Auckland).

Figure A1: Indicative distribution of high-DTI loans by buyer type and region
(% of total lending, excluding estimated measurement error)



Note: FHB refers to a first-home buyer, OOO refers to other owner-occupiers, and INV refers to borrowers with at least one investment property in the security pool.

¹² For simplicity, we do not currently model use of the other exemptions such as the construction exemption in this exercise.

The resilience benefits of a DTI policy would rise as the proportion of the stock of loans originated under the policy increases over time. We have developed a stock/flow model to better understand these dynamics. The model produces an estimate of the effect of the DTI policy on the stock distribution of loans by DTI and LVR, by combining our previous flow modelling with estimates of how existing borrowers transition between DTI and LVR buckets.

The Reserve Bank collects data on the transitions of borrowers between LVR buckets, and we have calibrated DTI transitions based on this data and allowing for income growth.¹³ We calibrate the current stock of high-DTI loans at 10 percent for owner-occupiers (based on the *Household Economic Survey*), and 30 percent for investors (based on their 55 percent flow share and tendency to make limited principal repayments).

Our estimates suggest that, assuming that the current flow share of high-DTI loans is maintained, the high-DTI share would increase significantly in the absence of policy intervention for both investors and owner-occupiers (table A2). Over 3 years, the imposition of a DTI limit would result in the high-DTI share instead remaining broadly stable. As discussed in the consultation paper, international evidence suggests that having less high-DTI loans outstanding should reduce defaults and household stress during a severe downturn.

Table A2: Estimated alteration in high DTI stocks under policy (preliminary)

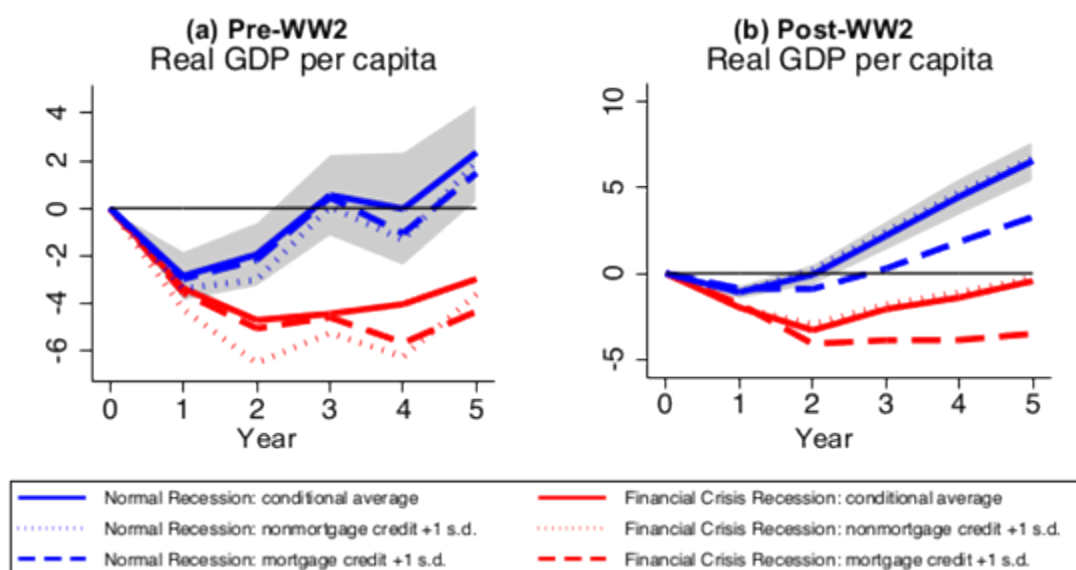
	Owner-occupiers			Investors		
	1 years	2 years	3 years	1 years	2 years	3 years
% of high-DTI loans						
Baseline	15	19	21	37	40	42
With DTI Policy	12	13	14	28	27	25

Benefits of the policy: reduced risk of crisis

- Jorda, Schularick and Taylor (hereafter JST, 2014) study the impact of housing credit booms on the risks of financial crisis. They note that housing credit has become a steadily larger share of bank balance sheets over the post WW2 period, and look for signs that the influence of housing credit on crisis risk may have intensified as a result. Indeed, they find that fast housing credit growth significantly increases the risk of a financial crisis, particularly in the post WW2 period.
- JST (2014) also demonstrate that financial crises and recessions have both been substantially worse in the post WW2 period if preceded by fast housing credit growth. The chart below is a representative example.

¹³ Estimated principal repayment rates were calibrated based on the LVR data and the LVRs of borrowers within each DTI bucket. Transitions were then based on the ratio of estimated principal repayment relative to the amount of repayment required to shift the average borrower down one bucket. We allowed for 10 percent growth in incomes for FHBs, and 2.5 percent for other borrowers.

Figure 7: Effect of Credit Booms on Recessions and Financial Crises



Note: This is sourced from Jorda Schularick and Taylor (2014).

- In a later paper (Jorda Schularick and Taylor (JST, 2015)), the authors go on to demonstrate that housing bubbles (house prices that are sharply elevated then fall by at least 15 percent) lead to large declines in economic activity. These housing bubbles often cause financial crises, and in that event the output costs are worse, but they are still very significant if no financial crisis occurs. Financial crises are defined by JST (2015) and other authors as periods where there are “widespread financial insolvencies or significant policy interventions”.
- In the post WWII period, the authors identify 25 recessions associated with housing bubbles, with slightly more than half of those being “financial crisis recessions”. This is about 1.5 episodes per country in the sample. The output costs of a housing bubble appear to exceed 10 percent of GDP even if there is no financial crisis (figure 8a in JST (2015)), and are substantially larger on average if financial crises are included (figure 6 in JST (2015)).
- For the costs of a financial crisis, we use a conservative estimate of the baseline consequences of a financial crisis that has been used in earlier Reserve Bank analysis, 20 percent of GDP. This is at the low end relative to studies that allow for the risk that a financial crisis has a permanent effect on GDP. For example, one Bank of England study found the expected cost of a banking crisis could be 43 percent of GDP in net present value terms. In this study (Brooke et al (2015) the authors used data from the GFC to separate out the direct cost of a banking crisis from other macroeconomic shocks.
- Brooke et al (2015) discuss how the probability of a financial crisis during a ‘peak’ risk environment is considerably larger than the typical probability of a financial crisis. For example, with capital ratios set to 11%, Brooke et al find the chance of a financial crisis in typical times is around 0.5-0.7%, while it is around 3-4% in peak conditions. A DTI policy would be introduced at a time when the Reserve Bank judged that house price appreciation and high DTIs created a risk of crisis. So we consider 5% (one crisis every 20 years) is a conservative baseline risk of housing crisis in an environment that RBNZ would apply a DTI policy. As discussed further below, not all housing crises would be expected to financial crises.

- The Reserve Bank has conducted several stress tests in recent years, in conjunction with the Australian Prudential Regulation Authority. The stress scenarios for these tests tend to assume a severe macroeconomic downturn featuring sharp falls in house prices (and other property values) of around 40-50 percent and large increases in unemployment to around 10 percent. Given the strong underlying profitability of the banking system, recent stress test results suggest that bank capital ratios would remain well above regulatory minima under these stress scenarios. However, the results also imply that the financial system would be far from fully functioning, with elevated levels of borrower defaults and conservative bank lending strategies exacerbating the weakness of the economy (along the lines discussed in section two). This is what we are thinking of as a housing crisis. The stress test evidence leads us to assume that a relatively small proportion (30%) of severe housing crises in New Zealand would lead to bank insolvency and a financial crisis, even if house prices fall substantially further than the 15% threshold used by JST (2015).
- How much would a DTI policy reduce the risk of crisis? It is not possible to infer this directly from JST (2014) or related papers by those authors, but they provide some suggestive evidence. For example Schularick and Taylor (2012) note that “a one standard deviation change in real loan growth (around 7%) increases the probability of a crisis by about 2.8 percentage points. Since the sample frequency of crises is just under 4 percent, this shows a high sensitivity of crises to plausible shocks within the empirical range of observed loan growth disturbances.” While the DTI policy is not expected to reduce real loan growth as much as 7%, it would be acting to reduce high-risk lending quite significantly. It thus seems plausible that the reduction in crisis risk from the policy would be significant. In the calculations below we assume the reduction in risk from the DTI policy is 20%. We also assume (working off Figure 7 above) that any crisis that did occur would be around 20% smaller in terms of GDP impact. Putting this together, the value of the reduced risk and reduced severity of crisis is just over 0.25% of GDP per annum when the policy is in operation (table 4).

Table 4: Summary of benefits from reduced risk and severity of housing crises and related financial crises

	Risk of housing crisis	of which, financial crisis	Cost if housing crisis (only)	Cost if housing and financial crisis	Total net cost (% GDP)
Baseline	5%	1.50%	10%	20%	0.65%
With DTI policy	4%	1%	8%	16%	0.40%
Reduction in costs					0.25%

- Arregui et al (2013) produce a similar calculation, but with much more substantial reductions in crisis risk as a consequence of macroprudential policies like DTI policies. This is based on a regression model which suggests that when house price growth and credit are highly elevated, relatively small reductions in those variables can substantially reduce the risk of crisis. In the spirit of taking a conservative approach to measuring benefits we have not used the estimates of crisis reduction risk from this paper.

Macro costs and considerations: Implications for house prices and credit growth during the boom

- The policy is expected to act by constraining some borrowers, reducing house sales and credit growth. However, houses not bought by constrained borrowers during a strong market will often be bought by someone else. Since investors are impacted more than owner occupiers by the restrictions, this is likely to lead to a modest rise in the home-ownership rate.
- Our intention would be to provide an exemption to the DTI rule for new builds, as already exists for LVRs. As such, we don't consider that these policies inhibit lending for construction. If anything, the exemptions would probably give banks a slightly greater incentive to originate loans for new builds. Feedback from the construction and banking industry on the exemptions for new construction provided under the LVR policy has generally been favourable (including the recent decision to extend the exemption to include the sale of new dwellings that have already been completed).
- There are possible 'second-round' effects on new builds. For example, if the owner of an existing dwelling lacks confidence in their ability to sell their existing dwelling (because of serviceability restrictions), this could stop that seller from buying a new build. However, serviceability restrictions would be put in place at times when the housing market is buoyant, so that determined sellers would generally still be able to sell (perhaps at a slightly lower price) despite the restrictions being in place. For these reasons, we expect that these second round effects would be fairly negligible.
- The policy should also not have significant impacts on rents. As discussed above, a DTI limit would be likely to reduce the number of rental properties over time (since landlords are significantly more likely to have high DTI loans). However, each additional property purchased by an owner occupier will reduce both the supply of and demand for rental properties, so the impact on rents should not be significant.
- The estimates described above suggest that around 10,000 borrowers might be prevented from purchasing due to a DTI limit. After allowing for the likelihood that some constrained borrowers would be replaced by low-DTI buyers, this suggests that house sales could fall by around 9 percent following the implementation of the policy. This could reduce house prices and credit growth by 2-5%, based on the response of house prices to a market sales shock reported by Bloor and McDonald (2013). This is in the neighbourhood of the market impact estimates of Arregui et al (2013), whose model suggested the typical DTI policy applied internationally reduced house prices by around 2.6 percent and credit (relative to GDP) by around 2 percent.
- In principle, a policy that reduces house prices can reduce GDP primarily through reducing consumer spending and housing construction. As noted above, the existence of the construction exemption should stop this policy from reducing housing construction (at the margin, it may increase). The impact on consumption should also be fairly limited. Firstly, wealth effects of even a permanent fall in house prices should be temporary (if households have a desired level of wealth, they will reduce consumption until they have accumulated sufficient wealth to rebalance their balance sheets). Secondly, monetary policy will also respond to the weaker consumption and attenuate the impact on GDP. Finally, the DTI policy will eventually be lifted, so the policy's impact on house prices should be temporary.
- The policy has been modelled in Reserve Bank's macroeconomic model (NZSIM). The results should be treated with caution as NZSIM is not designed to model macro-

prudential policy. For example, the model doesn't have the capacity to model quantity constraints, include an explicit model of banks, or distinguish between new and existing borrowers. As noted above, the simulations assume that monetary policy eases in response to any reduction in inflation brought about by the DTI policy, in line with the price stability objective of monetary policy.

- To proxy the effect of the DTI policy, we have assumed an increase in mortgage spreads, and a shock to house prices. Mortgage spreads increase by 10-30 basis points while the policy is in place, based on an assumed additional cost of obtaining a high-DTI loan from other sources (such as non-bank lenders) of around 250 basis points, and around 8 percent of new borrowers being constrained by the policy (see Box A). Additional judgement was used to ensure that house prices fall by around 2-5 percent in the first year after the policy is implemented, consistent with the analysis above. The impact of the policy on consumption was judgementally attenuated in the simulation, in line with evidence that the response of consumption to LVR restrictions has been much smaller than would be expected based on the house price impact.
- The simulation suggests that activity would decline by a peak of around 0.1-0.5 percent one year after the policy is implemented. Activity recovers fairly rapidly after the first year, as the impact on house price inflation dissipates and monetary policy eases. The average impact on GDP is around 0.05-0.24 percent per annum while the policy is in place (assumed to be four years). We adopt 0.1 percent of GDP as an expected macroeconomic cost (per year that the policy is expected to be in place), reflecting that GDP is likely to move above trend further out due to the policy being removed and the prolonged effects of the monetary policy easing.
- There are some overseas studies of the short-run impact on GDP of debt-to-income policies, although the size of the estimated impact will depend heavily on how many borrowers are being constrained by the assessed policy. Bank of England (2015) finds that their DTI limit would lower GDP by 0.06-0.25 percent in an upside scenario for house prices where the policy becomes binding. Guiborg and Lagerwall (2015) find that a hypothetical DTI limit in Sweden, affecting around 15 percent of households, would lower GDP by a peak of 0.3-0.7 percent in the three years after implementation.

Deadweight costs on affected borrowers

- As described in the box, the DTI policy constrains a proportion of owner-occupier borrowers from purchasing, unless they are eligible for one of the exemptions (for example, they may be able to buy a cheaper house that falls within the exemptions, or a new property built using the construction exemption), or they are able to locate a lender willing to provide a loan under the speed limit.

In our view, the costs of a household that wishes to owner occupy being unable to purchase are larger than the costs facing an investor. An investor is able to reallocate their portfolio and hold different assets, while an owner occupier may be being prevented from transitioning into home ownership or moving.¹⁴ Similarly, the costs involved for a borrower that is prevented from topping up their loan are likely to be significantly lower (the consumer surplus attached to buying a house is likely to be much larger than the cost of having a slightly different profile of lifetime consumption, because of a temporary constraint on borrowing).

¹⁴ The portfolio reallocation (for reasons discussed below) should not alter the size of the housing stock or other capital stock – just the ownership. At the margin, less investors own houses, and they are instead held by owner occupiers.

- To simplify quantification of the impact of the policy, we assume the cost of being constrained for an investor or a borrower topping up is 15% of the welfare cost to an owner occupier purchasing. This suggests the policy is equivalent to constraining around 5,600 owner occupiers per annum (the model suggests it constrains around 2,300 owner occupiers as shown in the table above, and the other costs are associated with the modelled effects on investors and top-up borrowers).
- The welfare costs of constraining demand in the housing market will depend on the slope of the demand curve – how much consumer surplus buyers derive from being able to buy an owner-occupied property. In contrast to a tax, the constrained buyers will not automatically be those with relatively low consumer surplus. However, the existence of alternatives such as those described above should mean those who are strongly motivated to shift to owner occupying will be able to find a way to do so. This should reduce the welfare costs from the policy.
- It is also important to emphasise that the constraint isn't permanent. Some borrowers may become able to borrow at lower DTIs (e.g. via income growth). More importantly, the policy will be expected to be relaxed when housing market conditions stabilise. In expected value, we assume the average borrower is affected for around 2.5 years.
- There are studies of the non-financial benefits of homeownership, but as Sodini et al (2016) have stated, it is hard to control for all the intrinsic differences (such as average age and education level) between homeowners and renters. Even quasi-experiments typically involve financial inducements to become homeowners, which provide a windfall to those that buy (so that measured consequences may relate to the windfall rather than home ownership itself).
- Not being able to buy will also alter financial outcomes for the would-be buyer: if house prices rise or fall, they would have gained or lost financially relative to their situation if they had been able to buy. Instead, these financial outcomes are transferred to whoever ends up owning the house instead (a different buyer, or perhaps the would-be seller if they elect not to sell). These financial outcomes are transfers rather than deadweight costs so they shouldn't lead to first order welfare losses.
- Given all these considerations, we consider that 20% of typical rent is a reasonable upper bound for the welfare costs of not being able to purchase, for the average owner occupier impacted by the policy. Assuming rents around 5% of the average house price value and the weighted number of affected borrowers discussed above (for an average of 2.6 years), this is on the order of \$100 million per year (~.07% GDP). This estimate is based on a number of assumptions, so we have chosen to adopt an estimate we consider an upper bound. We are particularly interested in any feedback about alternative ways to estimate this impact.

Q6: Do you agree with our assessment of the impacts of a DTI policy as described on the housing market – in particular, that it would not materially affect construction, and would if anything tend to increase the home ownership rate? Are there other potential consequences of the policy for the housing market that we have not discussed?)

Other considerations

There are a number of other potential costs and benefits of the policy which we consider small relative to the values of the three key channels described.

- **Reduced volatility.** We have counted the costs and benefits of the policy on a risk neutral or expected value basis. In reality, households and firms are likely to prefer a more stable path for GDP, all else equal. The DTI policy reduces expected variability in GDP by reducing GDP slightly during relatively strong times, while reducing the risk and severity of a substantial fall as a result of a crisis. The BIS (2010) make a similar point about boosting capital ratios, concluding it is potentially a significant benefit.
- **Administrative costs.** Administrative costs related to a DTI policy should not be large, as the Reserve Bank intends to continue collecting DTI data for risk monitoring purposes even if no limits are implemented. Banks already maintain home loan origination policies, and would mainly need to modify those.
- **Fiscal factors.** BERL (2017) recently considered fiscal savings from transitioning renters to home ownership, on the assumption that this transition also gradually changed their “hospitalisation, correction and benefit behaviours” to mirror those of owner occupiers. As described above, this relies on the assumption that home ownership is the underlying causal factor, which may not be correct, but it is still interesting to consider the magnitude of the savings estimated. If these changes in household behaviour occur gradually (BERL assumed they were 90% complete after 15 years), BERL estimated that the fiscal savings from encouraging 1000 households into homeownership would be around \$10m over 15 years. While the DTI policy constrains some people from becoming homeowners, it is actually expected (see above) to raise the homeownership rate by disproportionately affecting investors. For these reasons, the policy may lead to modest fiscal savings.

Overall assessment

Table 5: Summary of key costs and benefits

Key Benefits	Key Costs
Reduced risk of output loss in a crisis (expected value 0.25% of GDP)	Drag on output from policy (~0.1% of GDP)
	Inhibiting some home purchases (~0.07% of GDP)

- Notice that the costs and benefits are both measured in annual terms while the policy is in place. Each year, the risk of a crisis is reduced, while some borrowers are constrained and there is a small impact on the level of economic activity.
- There are a number of assumptions throughout this calculation (and the microeconomic modelling that is described in the box) that mean the results can't be taken as precise. The result is intended to demonstrate that it is plausible that the benefits of DTI limits could significantly exceed the costs. We will continue to work on the tools being used here and would need to produce a more precise cost benefit analysis if any specific policy was being proposed in the future.

Q7: Please comment on the Reserve Bank's analysis of the potential costs and benefits of a DTI policy. Do you see other material costs or benefits, or have views about the magnitudes of the costs and benefits or the method used to derive them?

Conclusions

The Reserve Bank considers that a DTI limit, or other serviceability restriction, would reduce the risk of a severe housing downturn in certain circumstances, and attenuate the impact of any downturn on the wider economy. We illustrated the channels through which this could work in section 2 and quantified the potential benefits in section 7.

While the policy would stop some potential buyers from purchasing homes, the policy offers a variety of options for affected borrowers (such as searching for a speed limit loan, bringing down planned debt to income, buying a cheaper home, or using the construction exemption). This should limit the welfare costs of the policy, as those who are most motivated to transition to owner occupation would still have paths to do so. Our preliminary analysis suggested that such options would reduce the likely costs of the policy to significantly less than the modelled benefits.

The Reserve Bank considers that there are circumstances in which a DTI policy would be desirable, but if actual policy implementation was ever proposed there would be a further detailed consultation on the specific terms of the policy proposal, including a Regulatory Impact Statement. While the Reserve Bank considers that it would be desirable to introduce DTIs into the macro-prudential toolkit, the Reserve Bank does not see a case for actual implementation at this point.

The Reserve Bank will consider all feedback to this consultation and publish a response to the feedback later in 2017. In the meantime, we will continue to work with banks to improve the data on DTIs and continue to improve our assessment of systemic housing risk. Even if a DTI tool is not used, we consider that the DTI data will be a useful addition to our monitoring framework as well as providing useful information to the senior management and boards of the lending banks.

Annex: Summary of questions for feedback

Q1: Do you have any comments on the evidence that high DTI borrowers are more susceptible to mortgage default and consumption stress? Are there other relevant studies, or other relevant channels through which a DTI policy would influence financial stability?

Q2: Do you agree that the current levels of debt (relative to income) that some borrowers are able to borrow risk putting them under pressure, especially if interest rates rise? Why are the DTIs achievable in New Zealand apparently higher than in other markets like the UK?

Q3: Do you agree with our assessment of other possible policies that are under the Reserve Bank's control, or do you think one or more of them could be preferable to DTI limits? Are there other policy options under the Reserve Bank's control that we haven't listed that could be relevant?

Q4: If a DTI policy was used, what would be the challenges and issues that could arise in the detailed rules and (for lenders and the Reserve Bank) monitoring compliance with the policy?

Q5: Do you agree that a DTI policy (if implemented) should be broadly as described above (a speed limit, with similar exemptions to the LVR policy)? Are there other design options or additional exemptions (besides the suggestion described above for relatively inexpensive owner occupied homes) that would be worth considering?

Q6: Do you agree with our assessment of the impacts of a DTI policy as described on the housing market – in particular, that it would not materially affect construction, and would if anything tend to increase the home ownership rate? Are there other potential consequences of the policy for the housing market that we have not discussed?)

Q7: Please comment on the Reserve Bank's analysis of the potential costs and benefits of a DTI policy. Do you see other material costs or benefits, or have views about the magnitudes of the costs and benefits or the method used to derive them?

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