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Ben Lockwood (Head of the Department of Economics, University of Warwick) and Michael Ward (Head of the Department of Economics, Monash University)

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The relationship between inequality and bank credit in Australia

Jamie van Netten*

Abstract

This paper examines the relationship between economic inequality and expansions of bank credit in Australia throughout recent decades. This relationship is a central component of what has become colloquially known as the "Rajan hypothesis" and more technically referred to as the "inequality, credit, crisis nexus". The findings of the paper suggest that although there is a strong positive relationship between inequality and expansions of bank credit in Australia at the most aggregated level (consistent with international studies of the phenomenon in which Australia was included in panel data), when the types of loans are examined in more detail, their correlation with inequality is not consistent with the belief that credit is channelled specifically to low income households as inequality worsens (as is suggested by the Rajan hypothesis). There are multiple ways in which the Australian case differs from the American which may contribute to the differing results, some of which include a lower levels of income inequality, more progressive taxation policy which reduces consumption inequality, and stricter macroprudential policy which resulted in fewer subprime loans.

JEL codes: D63, E51, G21, G28

Keywords: Inequality, Credit booms, Loans, Rajan

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Introduction

The Rajan hypothesis, and variations of it, have been used to explain the role of economic inequality as a major contributor to the GFC and, retrospectively, the great depression (Rajan 2010; Kumhof, Rancière, and Winant 2015). The hypothesis depicts the causal links between growing income inequality, credit booms, and subsequent financial crises. The narrative attached to these causal connections, expressed by Rajan (2010), is when income inequality worsens, the government needs to take some type of mitigating action. Many of the actions necessary (like wealth redistribution through taxation) are politically unpalatable, so the government may opt for a less painful though more myopic method: expansions of government supported credit. This enables income inequality to remain unchecked but masks its immediate effects through a reduction in consumption inequality. This theoretically provides enough short-term relief to the victims of income stagnation to maintain confidence in the incumbent government. The political dangers of ignoring inequality became clear in the US when George Bush senior seemingly lost his re-election campaign because he did not prioritize the high unemployment rate that persisted after the 1991 recession (Rajan 2010, p.15). Rajan claims that these political forces, combined with the short term incentives and moral hazards that can emerge in an underregulated financial industry, creates a strong pull towards economic crisis.

This paper will analyse whether or not a similar relationship between economic inequality and credit expansions can be observed in Australia. It will first set out to identify whether there is a positive and statistically significant relationship between inequality and credit expansion. It will then test if this relationship holds when specifically examining household debt. Finally, the relationship between income inequality and different types of household debt will be examined to determine if they comply with the underlying mechanics and assumptions of the Rajan hypothesis.

Literature review

Rajan (2010) was among the first to propose the relationship described in the introduction. He listed it among his theorized ‘fault lines’. The fault lines he describes are likened to tectonic plate movements that, when pushing against each other, can cause catastrophic

damage through the creation of an earthquake. In his reimagining of the term, the fault lines consist of fatal combinations of democratic processes interacting with financial markets, and different styles of financial markets interacting with each other. The use of the term fault lines is made all the more interesting when considered in the light of his insistence that the resulting economic catastrophe cannot be blamed on any individual sector or group of people. Rather it was the result of different systems composed of (for the most part) well intentioned and rational people being led by misaligned incentives. He repeatedly asserts that it is not necessarily the case that governments deliberately "dreamed up a Machiavellian plan to assuage anxious voters with easy loans…their actions could have been guided by the voters they cared about…[nonetheless] whether the action was driven by conscious intent or unintentional guidance is immaterial to its broader consequences" (Rajan 2010 p. 39). His solutions to economic crises, therefore, do not purely consist of blame and prosecution, but of reforms to the financial industry and the economy as a whole.

The other names often associated with the inequality, credit, crisis nexus are Kumhof, Rancière, and Winant (2015), who added a layer of technical rigor to Rajan's claims. They first outline how leading into both the GFC and the great depression, there was an increase in income inequality and debt-to-income ratios for middle and lower income households (similar to Rajan's claims). Through these historic events, they are able to generate several stylized facts including: in the leadup to both major crises, an increase in income inequality was accompanied by growth in aggregate household debt; before both crises, there were large differences between high income households and all other households in terms of debt-to-income ratios; leading into both crises, income inequality was also associated with diverging shares of overall wealth; and both crises were accompanied with high rates of defaults on household loans. After outlining these stylized facts, they develop a dynamic stochastic general equilibrium model demonstrating how income inequality can lead to a crisis. The model contains two infinitely lived representative households, one representing 'top earners' who have the ability to extend loans, and one representing 'bottom earners' who have the ability to receive loans and who also may choose to default on these loans with a certain probability. With this basis, the model proceeds to demonstrate how permanent positive shocks to the income share of high-income households will increase

their level of savings and, therefore, increase the volume of loans extended to the low-income households. This increase in lending satisfies the wealth preferences of high-income households while allowing the low-income households to maintain or even increase their consumption in the face of diminishing relative incomes. However, as the extension of credit continues to grow, so too does the probability of default (which becomes increasingly rational as the level of debt grows) and financial crisis. Overall, the model shows how, in the presence of increasing inequality, expanding levels of debt and financial crisis can occur endogenously within an economy, while meeting all the requirements of the stylized facts mentioned above. Furthermore, it can be calibrated using data to predict future financial crises.

Returning to Rajan's bank credit narrative, the general belief that easy credit was promoted as a means of limiting consumption inequality in the presence of growing income inequality has gained support from a broad spectrum of economists – both orthodox and heterodox. Setterfield (2020), in addition to his demand-side theory that the American growth regime has been depended on escalating household debt to generate sufficient aggregate demand, also claims that easy credit acted as a material panacea, necessary to manage "the discontent of the losers". His argument revolves around the idea put forward by Social Structure of Accumulation theorists in the early 1990s that the working class needed some material comforts to maintain their belief and enthusiasm for capitalism in the presents of "low wage growth, re-assertion of capitalist control of the workplace, and heightened employment insecurity visited on the majority of the working population by neoliberal labour markets" (Setterfield 2020 p.2). This comfort, Setterfield claims, was delivered in the form of abundant credit so as to limit the growth of consumption inequality in the presence of expanding income inequality. Furthermore, Setterfield argues that the rise of populism observed in America (as well as many other advanced economies) is the result of the end of the era of debt fuelled consumption, brought on by the great recession, "resulting in a sudden and acute onset of economic pain" (Setterfield 2020).

In terms of the empirical aspects of the Rajan hypothesis, Yamarik, El-Shagi, and Yamashiro (2016) state that the Rajan hypothesis can be divided into two distinct parts. The first part is the assertion that expansions of credit make financial crisis more likely. The second part is the relationship between growing inequality and expansions of credit. They show that the

first part has been widely researched and there is growing evidence to the affirmative: expansions of credit do appear to increase the likelihood of financial crisis. They claim that the second part of the hypothesis, however, has not been given as much attention. They then present the method and results of a statistical analysis using US state level panel data (using the ratios of bank loans to individual incomes as the dependent variable, and inequality metrics, including the Gini coefficient, as the independent variable). They find that there is indeed a positive long-run relationship between income inequality and real estate lending in the US, consistent with the general predictions of the Rajan hypothesis. They are able to conclude from this that inequality in America was likely a cause of the GFC, just as Rajan (2010) had asserted.

There have also been several studies testing the existence of the positive relationship between income inequality and expansions of credit using international panel data. One of the first was Bordo and Meissner (2012), who used a dynamic panel model with data from 14 OECD countries between 1920 and 2008. They found no evidence of a positive and statistically significant relationship between inequality and expansions of credit, though they did find a relationship between expansions of credit and financial instability. However, there have been many econometric criticisms made against Bordo and Meissner (2012). Gu and Huang (2014) argue that Bordo and Meissner's rejection of the connection between inequality and credit booms was a result of ignoring the large amounts of financial heterogeneity between different countries. Because the Rajan hypothesis is heavily dependent on the inner workings of the financial sector, there were a number of outliers in Bordo and Meissner's dataset which diminished the statistical significance of their results. By using differing econometric techniques (including random-slope estimators, mixed-effects models, and Granger causality tests) and different subsets of the data, Gu and Huang (2014) were able to show there was a positive and statistically significant relationship between inequality and credit booms. They caution the reader, however, that the Rajan hypothesis is not an iron law of economics but depends greatly on the level of financialization within an economy. They, therefore, do not discredit Bordo and Meissner's findings, but simply offer a different perspective on them.

Klein (2015) also provides evidence for the relationship between inequality and expansions of credit using international panel data from OECD countries. His methods differed from

Bordo and Meissner (2012) in a number of important ways, including a more precise measure of household debt and extra robustness checks by way of using several inequality metrics, including top 1% income share, the inverted Pareto–Lorenz coefficient, and the Gini coefficient. He also pays special attention to the long run effects and is able to show that there is a statistically significant long-run relationship between all the inequality metrics he used and household debt, consistent with the Rajan hypothesis and the formalized model of Kumhof, Rancière, and Winant (2015). The numeric results of his analysis show that in the long-run, a 1% increase in inequality is correlated with a 2–6 % increase in household debt (the range of 2-6% is a result of using several inequality metrics, all of which had positive and statistically significant results).

Perugini, Hölscher, and Collie (2016) also find a statistically significant positive relationship between inequality and household debt by using a simpler panel regression model (simpler than many of the long-run estimates cited above), though with a larger number of control variables in an attempt to lessen any omitted variable bias in their results. Included in their regression equation (which is estimating the effect of both inequality and financial deregulation on credit expansion) is a single lag of credit expansion itself, portfolio investments as a percentage of GDP, the real interest rate, broad money supply (expressed as a ratio of M2 to GDP), real GDP per capita, and the annual growth rate of GDP. They also included more countries in their panel data than what had been common among similar studies, using 18 OECD countries. However, they also delt with a smaller timespan, only using data from 1970 to 2007 (as opposed to Bordo and Meissner (2012), for example, who set the trend by including 14 OECD countries between 1920 and 2008).

As can be seen above, the majority of the empirical papers which test the Rajan hypothesis do so by using international panel data. They typically test for credit expansion by using data on 'household debt levels'. Although this is a necessary first step in testing the universality of Rajan's claims, it is not sufficient on its own to show that the mechanics which underlie the Rajan hypothesis are actually at play in each and every country included in the model. A central aspect of the Rajan hypothesis is that credit will be primarily extended to low income households to compensate for their reduction of relative income. Simply examining aggregated household debt levels does not reveal whether the credit is going to the low income households, as is essential in Rajan's narrative. Furthermore, Rajan himself does not

make any strong claims that his hypothesis is universal. His key objective is to describe the trends and causal flows in the American housing and financial markets that led to the GFC.

Mian and Sufi (2009) understand the necessity of a detailed analysis when examining the relationship between inequality and credit expansion, which is shown in their empirical analysis of the expansion of subprime loans in the years preceding the GFC. They attained a comprehensive data set at the ZIP code level, containing information on credit, house prices, defaults, income, and other demographic variables. They then tested the relationship between relative income growth and credit growth in subprime ZIP codes and found that they had a statistically significant negative correlation from 2002 to 2005. In other words, they found that strong relative growth in mortgage credit occurred in neighbourhoods with negative relative (and in some cases even absolute) income growth. They claim that this finding is inconsistent with what they call the 'income-based hypothesis', which is that the income of subprime borrowers was increasing in the years prior to the GFC, which made households which would usually not be creditworthy more acceptable for mortgages. They go on to claim that the results outlined above support what they call the 'supply-based hypothesis', which is that the expansion of subprime mortgages was driven not by any positive changes to the subprime borrowers themselves, but to the supply of such mortgages (which was in turn driven by the proliferation of mortgage securitization and the high demand for mortgage backed securities). They strengthen their support of the supply-based hypothesis by showing that the period in which credit growth becomes negatively correlated with income growth occurs at exactly the same time as the expansion of subprime mortgage securitization. They also show a disproportionate fall in denial rates in subprime ZIP codes during the period 2002-2005, a more rapid increase of mortgage securitization in subprime ZIP codes than in prime ZIP codes, and a higher rate of default in the period 2005-2007 in the areas with a higher portion of mortgages sold in private securitizations or to non-commercial bank finance companies.

Mian and Sufi's results go some way in partially validating the argument put forward by Dudley and Hubbard (2004) regarding financial deregulation. Dudley and Hubbard believed one of the many supposed benefits of financial deregulation was the positive effect it would have on mortgage applicants: "The revolution in mortgage finance has increased the ability of households to purchase their own homes . . . at times homeowners can obtain 100%

financing to purchase a home" (Dudley and Hubbard 2004 p. 17). The boom in subprime lending and it's correlation with the rapid uptake of mortgage backed securities conforms nicely with this point. However, Dudley and Hubbard also predicted that financial deregulation would create a more stable financial system, capable of managing and distributing the risk generated by this increase in credit. This was not just the opinion of Dudley and Hubbard; It was widely believed that, assuming efficient markets, financial deregulation would provide better price signals, increase liquidity, and spread risk in such a way as to promote financial stability while benefiting businesses and households with easier credit (Turner 2017). So although empirical results like that of Mian and Sufi (2009) validate the belief that financial deregulation leads to expansions of credit (which is a key feature of the Rajan hypothesis), they also discredit the accompanying belief that financial deregulation creates a more stable financial system.

So although the Rajan hypothesis has been largely validated in the case of the GFC, these findings do not necessarily transfer to all other cases with similar trends in inequality and household debt. For example, both Rajan (2010) and Kumhof, Rancière, and Winant (2015) claim that a similar relationship between inequality, credit expansion, and crisis can be seen in the leadup to the great depression. Galbraith (2009) also recognises these trends, however, claims that the expansion in credit that caused the stock market bubble and subsequent crash was speculative credit, which was primarily due to the overly optimistic public mood and not because of any policy creating conditions for easy money. In fact, he goes so far as to say, "much of the 1928 and 1929 speculation occurred on money borrowed at interest rates which for years before, and in any period since [as of the date of publication, 1954], would have been considered exceptionally astringent" (Galbraith 2009 p. 150). Though he claims speculative euphoria can proliferate at any time, the conditions which make it most likely occur after periods of great prosperity where profits and savings are high. He claims that the 1920s created these conditions. Furthermore, Galbraith goes on to claim that although the twenties are seen as a time of great wealth, they were also a time of widening income inequality. This income inequality, and resulting reduction in aggregate demand, meant that the health of the economy was largely dependent on high levels of investment and luxury consumer spending. Both of these forms of demand are subject to higher levels of fluctuation than the basic consumption of the working class and, more

importantly, they are also more susceptible to stock market crashes. Finally, although household debt was also increasing in the leadup to the crash, it was likely to compensate for lower relative incomes of the poorer households. Despite popular belief, Galbraith explains that average people were not entering the stock market in great numbers to share the wealth of the boom. This means that if income inequality were not as bad as it was during the twenties, the stock market crash may not have had such a devastating effect because the initial impact on aggregate demand would not have been quite so severe. It also means that as the boom took off, income inequality would have been worsened because the capital gains would have been concentrated in the people who already had the highest wealth. So the causality between inequality and credit expansion may flow both ways.

Galbraith's explanation of the great depression conforms generally with what has become colloquially known as demand-side economic theory (named after the central role given to aggregate demand in driving economic activity), first formalized and popularized in 1933 and 1936 by Kalecki (2013) and Keynes (1973) respectively. A common explanation given by contemporary demand-side economists (Skidelsky 2018; Setterfield 2010; Turner 2017) for the relationship between income inequality and recessions is that as income becomes concentrated in a smaller group of people, aggregate demand will shrink because the rich have a lower marginal propensity to consume. The claim that wealthy people have a lower marginal propensity to consume has been supported empirically by Fisher, Johnson, Smeeding, and Thompson (2020). This lower marginal propensity to consume of the rich is also present in the model developed by Kumhof, Rancière, and Winant (2015), though is typically referred to as a 'wealth preference'. Many demand-side economists believe this reduction in aggregate demand can be stalled and even reversed by an expansion of bank credit or an increase in government deficit spending; the latter being the preferred option in most developed countries during what has become known as the Keynesian era (spanning from the late 1940s to the 1970s) (Skidelsky 2018). However, since the stagflation of the 1970s, governments around the world have looked more to financial deregulation and the resulting expansions in bank credit rather than large government deficit spending to support aggregate demand (Turner 2017). However, congruent with the Rajan hypothesis, this increase in credit creates an increasingly unstable economy which is likely to eventually

collapse. This depiction of the inequality, credit, crisis nexus is very similar in many ways to that proposed by Rajan (2010), however, one crucial difference is that if expansions of credit are only intended to support aggregate demand (rather than gain political favour from low income households), the credit does not necessarily need to be channelled into low income households. As claimed by Galbraith (2009), the American economy prior to the great depression was being supported by high levels of investment and luxury consumer spending. Of course, the two depictions of the inequality, credit, crisis nexus are not mutually exclusive, and could both be at play simultaneously in the one economy, as explored by Setterfield (2020).

Moving onto the Australian case; based on the international analysis performed by many of the authors outlined above it would seem that, when examining the Australian results individually, there is a positive and statistically significant relationship between inequality and expansion of credit. Yamarik, El-Shagi, and Yamashiro (2016) describe how some results have found there to be a "positive relationship between income inequality and credit *only* in countries with majority voting systems: US, UK, Australia and Canada". Yet these results are all still at a very high level and typically only use aggregated data on household debt levels. To properly test whether the underlying mechanics of the Rajan hypothesis are present in countries other than America, a more detailed analysis is needed.

There are many distinct differences between the Australian and the American financial sector which might alter the underlying mechanics of the relationship between inequality and credit expansion. Debelle (2008) explains that although debt-to-income ratios are similar in Australia and America, the distribution of the debt is not. As opposed to the American environment prior and during the GFC, subprime loans in Australia made up a very small share of the mortgage market. So most of the debt in Australia was owed by households with the highest incomes, meaning that they were more able to service their loans. Debelle further enforces this point by presenting data on 'non-conforming loans', which he claims are a reasonable Australian analogue to subprime loans in America. He defines them as loans "provided to borrowers who do not satisfy the standard lending criteria of mainstream lenders such as those with impaired or incomplete credit histories. The loans are provided by a few specialist non-deposit taking lenders" (Debelle 2008). He goes on to show that non-conforming loans accounted for approximately 1% of outstanding

Australian loans in 2007, well below the 13% share of subprime loans in America. Finally, he explains why the Australian financial sector produced so few non-conforming loans and why the arrears rate on Australian non-conforming loans was substantially lower than US sub-prime loans in 2007. Firstly, the average loan-to-valuation ratio was lower for Australian non-conforming loans than for American subprime loans (75% and 85% respectively); secondly, Australian non-conforming loans rarely featured low introductory interest rate periods (otherwise known as "teaser rates"); thirdly, the lowest rated tranches of residential mortgage-backed securities were usually retained by the lenders or placed with closely associated entities, thus reducing the incentive to create mortgages which have a high likelihood of default; and finally, the Australian legal system gives the lender recourse to all the borrower's assets, not just the house, therefore giving the borrower a much stronger incentive to repay the loan. All four of these points work against the mechanics of the Rajan hypothesis. The first and third would reduce the likelihood that households of the lowest income brackets would be extended mortgages and the second and fourth points would make mortgages less attractive to households of the lowest income brackets. The majority of the above points made by Debelle relate primarily to the ability and desire of subprime borrowers in Australia to get mortgages. As argued by Green, Harper, and Smirl (2009), however, financial deregulation has still led to an expansion of household debt in Australia, though the greatest contributor to the recent growth in household debt (at the time the study was conducted) was being driven by borrowing to invest in rental housing.

There are also differences in the level of inequality between Australia and America. Historically, Australia saw reducing inequality (measured as income share of top earners) from the 1920s until the mid-1940s. The mid-1940s commenced a short period of increasing inequality before the trend reversed again during the early 1950s. After that, inequality continued to decline until the 1980s, after which it increased throughout the 1990s and 2000s (Atkinson and Leigh 2007). According to the World Inequality Database the income share of both the top 1% and the top 10% in Australia decreased a little during the GFC, but then gradually increased again over the proceeding decade. Similar trends can be observed when viewing the American data on income share of the top 1% (also available through the World Inequality Database). However, although the general trends look similar, the level of inequality has differed greatly between America and Australia. Fenna and Tapper (2015)

examine 25 income trends and 17 wealth distribution studies and claim that, although there has been an increase in inequality since the 1970s, the level and growth of income inequality in Australia has not been as severe as many other advanced economies. A cursory look at World Inequality Database data conforms with this depiction of Australian inequality: the American income share of the top 1% at times almost doubling that of Australia. Also, the top 1% in Australia have not claimed a larger share of income than the bottom 50% since the mid twentieth century; however, the top 1% in America have claimed a larger share since 1997 (a gap that continues to grow). Finally, according to World Bank Data, the American Gini index has hovered between 40 and 41.5 over the last 30 years; however, the Australian Gini index over the same period has hovered between 32.5 and 35.5. Therefore, although both countries have seen worsening inequality over the last four decades, it would seem as though income inequality in America has been substantially worse than in Australia. This too might change some of the dynamics described by Rajan, as income inequality is the key factor that sets the mechanics of credit expansion into action.

Finally, a core aspect of the Rajan hypothesis is the use of credit expansions to restrict growth in consumption inequality, while allowing income inequality to worsen. It is common in advanced economies for income inequality to be greater than consumption inequality (a trend which conforms to the Rajan hypothesis), and as shown by Barrett, Crossley, and Worswick (2000) and more recently by Kaplan, La Cava, and Stone (2018), both using data from ABS Household Expenditures Surveys, Australia also displays this same trend. Furthermore, both studies found that over the last several decades, Australia has been experiencing growing inequality in both income and consumption, however, the growth in income inequality has been larger than that of consumption inequality. Both papers offer similar explanations as to a possible cause of the difference between the growth of the two types of inequality: some of the growth in income inequality in Australia is caused by transitory fluctuations, which can be eliminated from consumption through consumption smoothing behaviour. Consistent with the Rajan hypothesis, consumption smoothing behaviour may involve households going into debt to maintain their consumption while their income diminishes, with the expectation of repaying the debt when their income increases again. However, the danger with this method, as identified by Rajan, is that future income may not increase again which puts the households at high risk of default. Kaplan, La

Cava, and Stone (2018) do in fact find that from the mid-2000s the source of income inequality changed from primarily transitory to primarily persistent factors. However, they also find that there was a rise in consumption inequality over this same period, so it seems as though low income households became aware that any negative shocks they experienced to income were likely to be persistent, so adjusted their consumption accordingly.

Rajan (2010) claims that consumption inequality could also be restricted through progressive taxation policies aimed at income redistribution. He then goes on to explain that redistribution through taxation was too politically derisive in America, so policy had to be geared towards expansions of bank credit to restrict consumption inequality. However, Australian taxation policy may play a more substantial role in income redistribution. The Australian Productivity Commission (2015) detail how tax policy has been used in Australia to redistribute wealth, starting their analysis by showing that in 2013/2014, tax revenue equated to 23% of Australia's GDP. Although this is not a very high percentage by general OECD standards, according to World Bank data it is over double the relative tax revenue in America at the time, which equated to just under 11% of GDP. Furthermore, by general OECD standards, Australian taxation tends to generate larger revenues through personal income tax (about 47% of all tax revenue in 2013/2014) and company income tax (about 20% of all tax revenue in 2013/2014) and a relatively minor amount through consumption taxation (GST accounted for about 16% of all tax revenue in 2013/2014). Finally, from the tax revenue generated in 2013/2014, 35% was channelled into 'transfer expenditure', the largest components of which included Age Pensions, Disability Support Pension, Family Tax Benefit Parts A and B, and Newstart Allowance. Although the portion of tax revenue spent on transfer expenditure fluctuates greatly (primarily due to fluctuations in tax revenue rather than transfer expenditure itself), the figure is typically between 30-40%. Overall, the Productivity Commission (2015) describes Australia's tax and transfer system as "highly targeted and progressive", meaning that it redistributes income from wealthy households to poor households by charging a higher marginal tax rate to higher incomes. Although Australia's level of transfers as a share of GDP is relatively low by OECD standards, the productivity commission claims that "many studies suggest that the Australian tax and transfer system performs well in reducing income inequality". This means that low income

households may not need to go into as much debt as their American counterparts, because Australia's taxation policy has already kept inequality at relatively low levels.

Hypothesis

To be aligned with the other academic literature on the subject, the hypothesis of this paper is that the Rajan hypothesis will hold when examining the Australian data. As stated by Rajan (2010), there will be a positive relationship between inequality and credit expansion and the theorized mechanism behind this relationship is as income inequality worsens, the government sets policy as to enable easier credit to low income households, especially in areas like housing, so as to maintain a certain level of consumption equality. Additionally, as relative income diminishes for lower income households, they may feel pressure to go into debt to maintain an adequate level of social status through their material possessions. As Rajan (2010 p.30) states, "Matters are even worse if the immobile measure their worth in terms of their possessions: my Chevrolet becomes much less pleasurable when my neighbour upgrades from a Honda to a Maserati". This need to maintain an adequate level of relative consumption as opposed to absolute consumption is also explored and to some degree verified by Frank (1985 and 2012). Building on this idea, as outlined in the literature review, Kumhof, Rancière, and Winant (2015) show how growing levels of inequality can endogenously lead to expansions of credit and financial crisis through high-income households extending more loans due to higher levels of savings and low-income households gladly accepting these loans in order to boost their consumption.

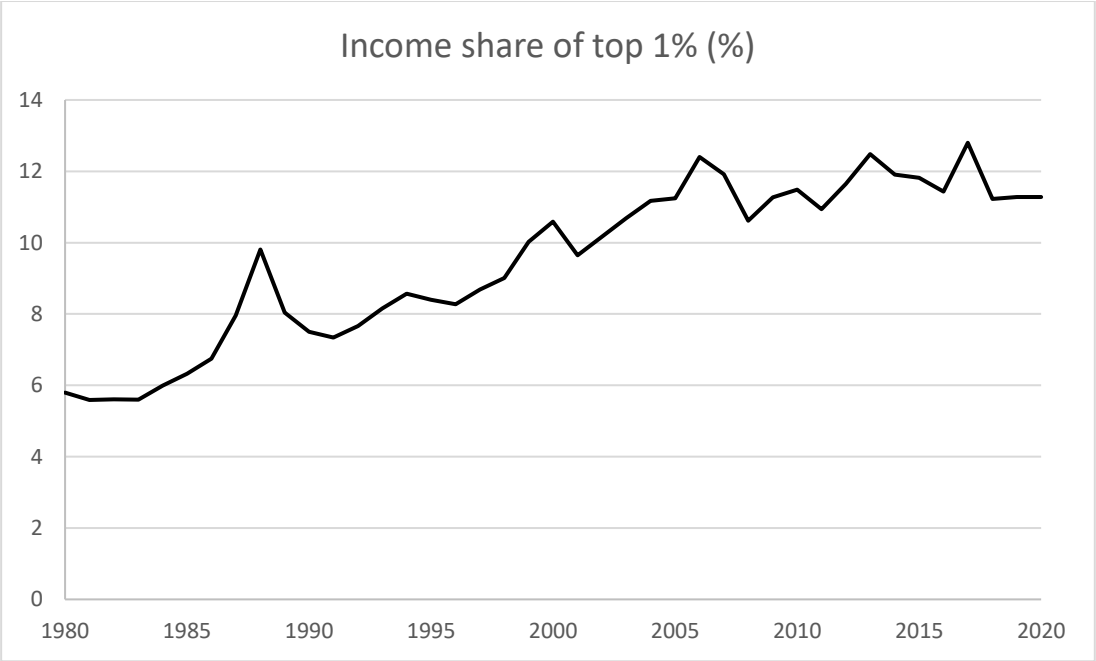
Data

The data used in this analysis consists of two inequality metrics and eight credit metrics. The two inequality metrics are used for robustness in the initial test of the relationship between inequality and bank credit, whereas the eight credit metrics are used to determine the distribution of credit in the Australian economy and which forms of credit expansion may be contributing to any overall relationship between inequality and credit. Any figures referred to in this section which are not immediately presented can be found in the appendix.

The two inequality metrics used in this study are the pre-tax income share of the top 1% and the Gini index (though primarily income share of the top 1% will be used as the dataset is more complete). The income share of the top 1% simply refers to the percentage of total income which goes to the top 1% of income earners. The Gini index is a ratio or percentage typically expressing the wealth distribution within a society. Specifically, the Gini index does this by comparing the area between a Lorenz curve and a 45 degree line (the 45 degree line represents perfect correspondence between population and cumulative income share) and the entire area beneath the 45 degree line (Gastwirth 1972). A Gini index of 0 means that there is no inequality within a society (expressed graphically as the Lorenz curve fitting perfectly to the 45% line of perfect distribution – e.g. 10% of the population will hold 10% of the income, 50% of the population will hold 50% of the income, etc). A Gini index of 100 means that there is absolute inequality (this would represent the dystopian and unlikely scenario where one person has all the income and everyone else has none). Values between 0 and 100 express all levels of moderation between these two extremes.

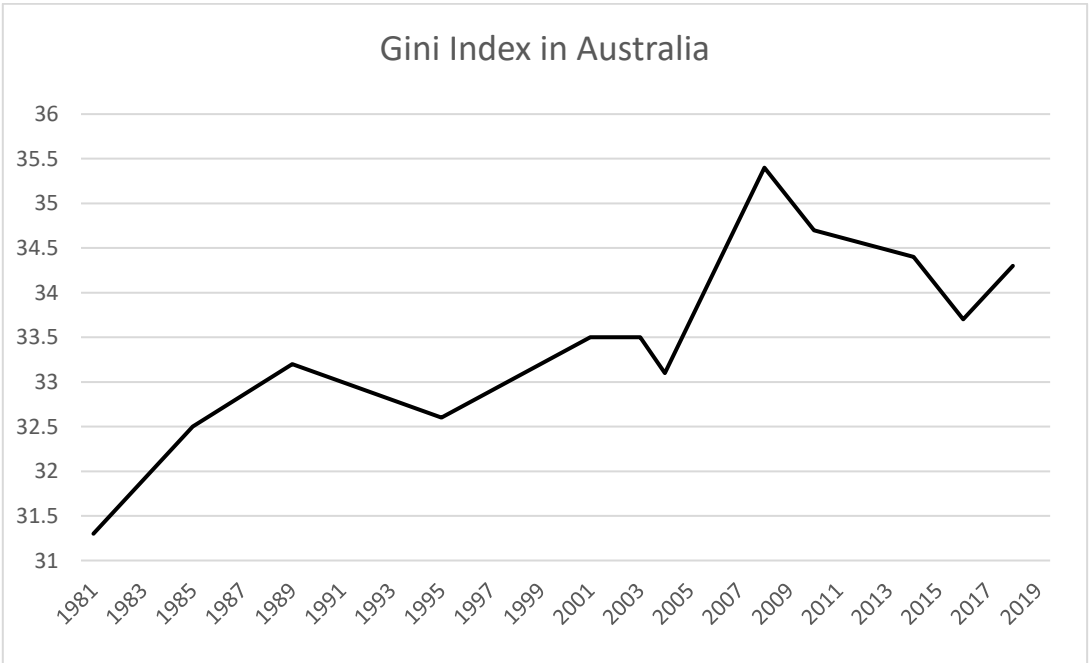
Figure 1 shows a time series of income share in Australia of the top 1% from 1980 to 2020. The data was taken from the World Inequality Database and is presented in one year increments. Figure 2 shows a time series of the Australian Gini index data from 1981 to 2018. The data was taken from the World Bank data portal and is missing multiple entries; in fact, over the 37 years it spans, only 12 data points were collected. Because of this incompleteness of the data, it will be used minimally.

Figure 1



Source: World Inequality Database

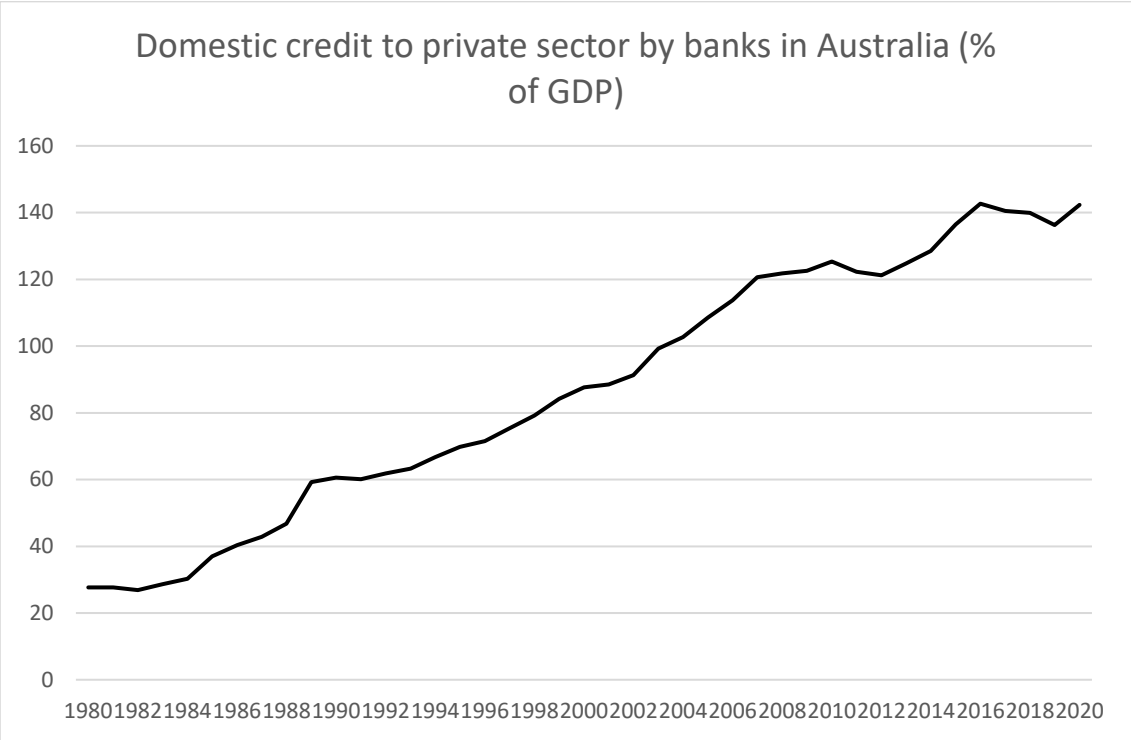
Figure 2



Source: World Bank

Figure 3 shows a time series of domestic credit by banks (as a percentage of GDP) in Australia from 1980 to 2020 and was taken from the World Bank data portal. It too is presented in yearly increments. The y axis shows the level of domestic credit extended by banks in Australia as a percentage of GDP.

Figure 3



Source: World Bank

Figure 4 shows a time series of the ratio of Australian household debt to annualised household disposable income from 1990 to 2020. The original data from ABS was presented in quarterly increments; however, to match the yearly data on income share of top 1%, I have averaged the quarters over each year to produce yearly increments.

Figure 5 shows a time series of the seasonally adjusted ratio of Australian owner-occupier housing debt to annualised household disposable income from 1990 to 2020. The original data from RBA was presented in quarterly increments; however, similar to the data on Australian household debt to income, to match the yearly data on income share of top 1%, I have averaged the quarters over each year to produce yearly increments.

Figure 6 shows a time series of the seasonally adjusted yearly number of new loan commitments to first home buyers in Australia from 2004 to 2020. The original data from ABS was presented in monthly increments; however, to match the yearly data on income share of top 1%, I have summed the months over each year to produce yearly increments.

Figure 7 shows two seasonally adjusted time series of the yearly monetary value of new loan commitments for total housing in Australia from 2004 to 2020, the upper line represents loans extended to owner-occupiers and the lower line represents loans extended to investors in housing. The original data from ABS was presented in monthly increments; however, to match the yearly data on income share of top 1%, I have summed the months over each year to produce yearly increments.

Figure 8 and figure 9 show seasonally adjusted time series of the yearly monetary value of all small purpose personal loans and large purpose personal loans from 2004 to 2020 respectively. The original data from ABS was presented in monthly increments; however, to match the yearly data on income share of top 1%, I have summed the months over each year to produce yearly increments.

Finally, figure 10 shows five time series of the percentage of population in debt by income decile in Australia (though only includes the bottom four deciles and the top one) from 2004 to 2020. The data was taken from the ABS and is in two year increments (it is also missing the 2007/2008 datapoint for all deciles).

Empirical Design

When testing the effect of inequality on credit expansion, the preferred method is to take long-run estimates like that of Klein (2015), who used a panel cointegration analysis to determine the long-run effect of inequality on credit (both of which are nonstationary, and as he found in his dataset, stochastic). A cointegration analysis would test if there existed a stationary linear combination of credit and the inequality measure of choice. If there was, they could be said to be cointegrated and therefore tend to move together in the long run. However, as explained by Klein (2015), this type of analysis works best when applied to large, pooled time series panel data. The small timespan of both the household debt data and lending indicator data, combined with the necessity for yearly increments to match the

inequality data, unfortunately precludes the possibility of performing a long-run analysis (even the far simpler distributed lag model would be too costly to the degrees of freedom). It is for these reasons that only the contemporaneous relationship between inequality and credit expansion will be tested.

A control for the time trend was included to avoid a spurious correlation, as many of the variables have positive time trends. A control for the real interest rate was also included (data taken from the World Bank data portal and represents the lending interest rate adjusted for inflation as measured by the GDP deflator. It should be noted that this data only went to 2019, so an estimation for 2020 was generated using Lenders' Interest Rate data from RBA and the GDP deflator from World Bank). Consistent with Perugini, Hölscher, and Collie (2016) the lending rate was used (as opposed to the policy rate) to allow for the complexity of institutional arrangements in financial markets. Finally, a control for GDP growth was included (data taken from the World Bank data portal).

Therefore, the simple regression equation used to determine the relationship between inequality and credit expansion for each metric is stated below.

$$Y_t = \beta_0 + \beta_1 S_t + \beta_2 R_t + \beta_3 G_t + \beta_4 t + \varepsilon_t$$

Y is the dependent variable, which will always be a form of credit expansion (e.g. monetary value of new loan commitments to owner-occupiers or yearly monetary value of all large purpose personal loans). S is the independent variable which will either be the Gini index or the income share of the top one percent. R is the real interest rate. G is annual GDP growth. t is the time variable, which will always be expressed as a year – this is included to remove the time trend in each regression. Statistical significance will be taken at the $\alpha = 0.05$ level.

To test the overall relationship between inequality and expansion of credit, 'Domestic credit to private sector by banks in Australia' will be regressed against the income share of the top one percent. 'Domestic credit to private sector by banks in Australia' will also be regressed against the Gini Index for robustness. The next steps will then be to determine if this relationship is of the nature described by Rajan (2010) and Kumhof, Rancière, and Winant (2015). To first confirm that the relationship between inequality and credit holds for

household debt, the 'ratio of Australian household debt to annualised household disposable income' and the 'ratio of Australian owner-occupier housing debt to annualised household disposable income' will both be regressed against the income share of the top one percent.

The next part of the analysis will test for one of the core assumptions of the Rajan hypothesis: as inequality worsens, credit will be channelled specifically to low income households, primarily through mortgages. This will be done by testing the relationship between income share of the top one percent and three different housing loan categories: loans for 'first home buyers', 'owner-occupiers', and 'investors in housing'. The three results will then be compared in terms of relative magnitude of coefficient, sign of coefficient, and statistical significance. If the Rajan hypothesis holds in the Australian context, the expectation is that the strongest positive relationship will be observed between income share of the top one percent and loans for 'first home buyers'. The assumption being if policy is set to incentivise banks to increase their lending to low income households, primarily through lowering their lending standards, households who would not have been deemed credit-worthy in the past will become credit-worthy and will, therefore, become 'first home buyers'. So if the government sets this type of policy to lessen the immediate effects of worsening income inequality, in accordance with the Rajan hypothesis, there should be a strong and positive relationship between inequality and the number of first home buyers. The next strongest relationship should be seen in 'owner-occupiers', though the relationship may be weaker as this includes all owner-occupier home buyers (including those who have already been deemed credit worthy for a mortgage in the past). Finally, the relationship between income share of the top one percent and 'investors in housing' should be the weakest. This is because policy aimed at helping low income households attain a mortgage should only help investors in the housing market in an indirect way (for example, through a reduction in interest rates). The policy would not be targeting them specifically as very few of them are likely to be subprime borrowers. This part of the study should also be largely impervious to any omitted variable bias, as it is examining how the coefficients compare to each other, rather than their exact values (this of course relies on the assumption that any omitted variable bias would effect each of the lending types equally and in the same direction).

The final part of the analysis will examine the other predominant types of loans banks extend to households: personal loans. Although Rajan (2010) primarily refers to mortgages as the means through which governments facilitate credit extensions to low income households, Kumhof, Rancière, and Winant (2015) speak more generally about consumption. Their model primarily demonstrates the process through which as income inequality worsens, high income households will increase their savings and low income households, seeing their relative income diminish, will respond to this increase in loanable funds to increase their consumption. Therefore, the positive relationship between income inequality and extensions of credit to low income households can occur endogenously, without the present of active government policy. The two types of personal loans examined in this part of the analysis are small purpose personal loans and large purpose personal loans. Although both are predicted to have a positive relationship with income inequality, small purpose loans are predicted to have the stronger positive relationship, as these types of loans would likely be more common among low income households (as they include loans for 'household and personal goods', 'purchase of other vehicles and equipment', and 'travel and holiday', as opposed to large purpose loans which include 'personal investment (excluding housing)' and 'purchase of road vehicles').

In addition to the above analysis, the percentage of population in debt by income decile can also be examined for any interesting trends. The data is unfortunately insufficient to perform any meaningful regressions, however, the time trends of each deciles percentage of population in debt can be examined. Though it would be a weak finding, the expectation which aligns with the Rajan hypothesis and Kumhof, Rancière, and Winant (2015) is that the percentage of population in debt of the lower deciles would have a positive time trend and the percentage of population in debt of the highest decile would have a negative time trend.

Results

The tables referred to throughout this section can be found in the appendix. They contain information for the intercept, the independent variable, the real interest rate, and the time trend. The information recorded is the estimated coefficient, the standard error, the t value,

and the p value. The results of the above analysis should also be viewed as tentative, due to restrictions caused by the small timespans of some of the data.

As can be seen in Table 1, there is a strong and statistically significant positive relationship between the income share of the top 1% and domestic credit to private sector by banks in Australia: a one percent increase in the income share of the top 1% is correlated with an increase in domestic credit as a percentage of GDP of approximately 2.65. Furthermore, as can be seen in Table 2, a similar trend can be seen when replacing the income share of the top 1% with the Gini index: a unitary increase in the Gini index is correlated with an increase in domestic credit as a percentage of GDP of approximately 3.53. However, this result was not statistically significant at the $\alpha = 0.05$ level, though this is not surprising due to the many missing entries in the Gini index data, such that there were only 12 datapoints to regress. Additionally, when testing that this relationship holds for household debt levels, Tables 3 and 4 show that it does: a one percent increase in the income share of the top 1% is correlated with an increase in the ratio of Australian household debt to income of approximately 8.47, and a one percent increase in the income share of the top 1% is correlated with an increase in the ratio of Australian household owner-occupier housing debt to income of approximately 2.17 (both of which are statistically significant).

The above results conform with many of the results derived by the pre-existing literature on the Rajan hypothesis at an international level. However, when examining different components of the credit expansions and their individual relationships with income inequality, the results start to diverge from the predictions of the Rajan hypothesis. Although the Rajan hypothesis should predict a strong positive relationship between income inequality and the number of new loans given to first time home buyers, Table 5 shows that has not been the case in Australia: There is a statistically insignificant relationship of a one percent increase in the income share of the top 1% being correlated with a decrease of the yearly number of new loan commitments to first home buyers of approximately 2248. However, of the three categories of home loans examined, first time home buyers is the only one to produce a negative coefficient. As shown by Tables 6 and 7, a one percent increase in the income share of the top 1% is correlated with an increase in the monetary value of new loan commitments extended to owner-occupiers of 6.49 billion (however, this result is also not statistically significant), and a one percent increase in the income share of

the top 1% is correlated with an increase in the monetary value of new loan commitments extended to investors in housing of 14.37 billion (this relationship is the only one of the three housing loan categories to produce a statistically significant coefficient, and it is highly statistically significant with a P-value of 0.013). It is also revealing that although investors in housing account for a substantially smaller amount of new loans, the positive coefficient associated with their relationship to income share of the top 1% is more than double the size of the coefficient of the owner-occupier relationship to income share of the top 1%.

Finally, the relationship between the income share of the top 1% and personal loans conforms with the expectations of the Rajan hypothesis and, more appropriately, the predictions made by Kumhof, Rancière, and Winant (2015). As can be seen in Tables 8 and 9, a one percent increase in the income share of the top 1% is correlated with an increase in the yearly monetary value of all small purpose personal loans of 0.285 billion (which was statistically significant), and a one percent increase in the income share of the top 1% is correlated with an increase in the yearly monetary value of all large purpose personal loans of 0.418 billion (this relationship, however, was not statistically significant). In addition to being the only statistically significant result of the two types of personal loans, the small purpose loans coefficient also has a larger relative magnitude when compared with the sizes of the respective market. The coefficient for large purpose loans is only about 45% larger than the coefficient for small purpose loans, despite the total annual value of all large purpose loans typically being around twelve times the size of small purpose loans.

As a minor addition to the above results, it can also be observed in Figure 10 that the yearly time trends in percentage of population in debt for all four of the lowest income deciles have a positive time trend and the highest has a negative time trend (the lowest has a time trend of 0.31 and the highest has a time trend of – 0.1). This means that since 2004 there has been a gradual increase of low income households in debt and a very gradual decrease of high income households in debt.

Discussion

On the highest level of aggregation, these results tend to agree with the pre-existing academic literature on the Rajan hypothesis which include Australia in the international

panel data – the mechanisms of the Rajan hypothesis do appear to be at play in the Australian economy. However, when the main contributors to household debt and their relationship with income inequality are examined individually, the relationship becomes a little different to that described by Rajan (2010). The correlations with income inequality shown by the three different categories of housing debt were the exact opposite to what was expected, with the strongest positive (and only statistically significant) relationship appearing between the top 1% income share and the total value of loans for investor housing, and the relationship between the top 1% income share and the number of loans for first time home buyers being negative. Although this does contradict the belief that the Rajan hypothesis holds in the Australian context, rendering that aspect of the hypothesis incorrect, it does align with the description of the Australian financial sector given by Debelle (2008) and Green, Harper, and Smirl (2009).

As described in the literature review, Debelle (2008) showed the distinct differences between the Australian mortgage market and that of the US. Factors were at play in the Australian context which lessened both the supply of subprime loans (for example, lenders having higher down payment expectations and typically retaining the lowest rated tranches of residential mortgage-backed securities or placing them with closely associated entities) and the demand of subprime loans (for example, the rare use of teaser rates to lure low income households into contracts which would become less favourable over time and the lender's legal recourse to all the borrower's assets, not just the house, in the case of default). Although these may have lessened the number of subprime loans banks were willing and able to make, they would have had a much smaller effect on prime owner-occupier borrowers and investors in housing. In fact, not only were these two groups of borrowers unlikely to be stymied by the factors described by Debelle (2008), but they would have also been benefiting from the financial deregulations which have been happening since the 1980s (Green, Harper, and Smirl 2009). So it is possible that financial deregulation was occurring in response to growing inequality as a means of credit expansion (as theorised by Rajan and the demand-side economists mentioned in the literature review), however, it would appear the main benefactors of the deregulations in Australia have been investors in housing. This outcome may also have fed back into growing inequality, making the causal link between inequality and credit expansion run in both directions.

The analysis was not restricted to housing loans, however; personal loans (though they accounted for a substantially smaller amount of household debt) were also examined. These types of loans conformed more with the expectations of the Rajan hypothesis, though as stated above, the model created by Kumhof, Rancière, and Winant (2015) is better equipped to explain the mechanisms behind this relationship. The model depicts high income households with a wealth preference (and therefore a high marginal propensity to save) and low income households with a desire to increase their immediate consumption. Therefore, as income becomes concentrated in the high income households, there is an increase in loanable funds which the low income households use to increase their consumption. This is a very plausible explanation for the relationship seen in Australia between income inequality and expansion of personal loans because it requires no specific government policy to set it into action – it can happen automatically within an economy with growing income inequality. Its effects may even be magnified by the importance people place on relative consumption over absolute consumption (Frank 1985 and 2012): if low income people perceive their consumption growing at a smaller rate than that of higher income people, they may feel the need to go into debt to maintain a more acceptable level of social status, and according to the model created by Kumhof, Rancière, and Winant (2015), they will have access to an increased amount of loanable funds to make it possible.

Finally, the positive yearly time trends in percentage of population in debt for all four of the lowest income deciles should not be seen as either good or bad as they may be using their increased access to bank credit to increase their lifetime utility through consumption smoothing. The only risk that this trend brings is that described by Kumhof, Rancière, and Winant (2015), where if the level of debt in the low income households becomes too high, they might be incentivized to default as the lifetime utility maximizing option.

Conclusion

There is less evidence in the Australian financial sector of the mechanisms described by Rajan (2010) than in the American financial sector (the intended context of the book). Although the high level aggregated data seems to give the impression that the Rajan hypothesis holds in the Australian context, this becomes less convincing when examining

different aggregates in housing loans, with the only positive statistically significant relationship being between top 1% income share and the total value of loans for investors in housing; and the relationship between top 1% income share and loans to first time home buyers being negative and statistically insignificant. However, there does appear to be a relationship in the personal loan data which supports the Rajan hypothesis, or more specifically, the model created by Kumhof, Rancière, and Winant (2015). The reason the Australian housing loans data does not seem to conform with the predictions of the Rajan hypothesis is multifaceted, however, several possible factors include the stricter lending regulations in Australia, a more prudent banking culture, the lower degree of inequality in Australia when compared to America, and Australia's progressive taxation policy which redistributes income and reduces consumption inequality (therefore, lessening the need to inject credit into low income households through subprime mortgages).

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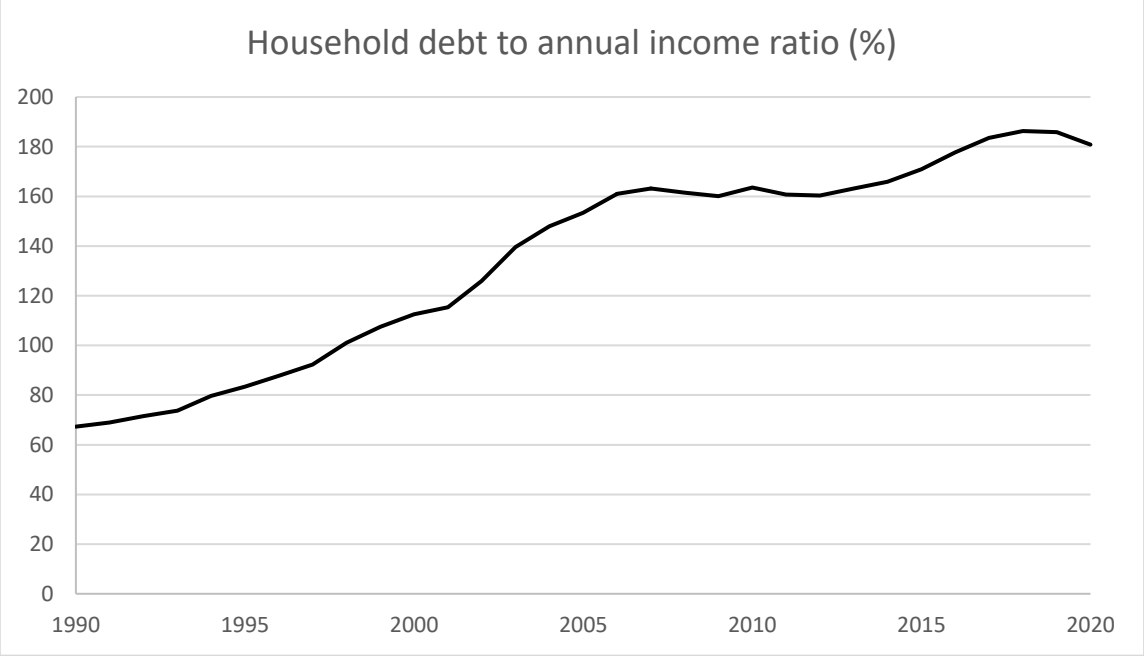
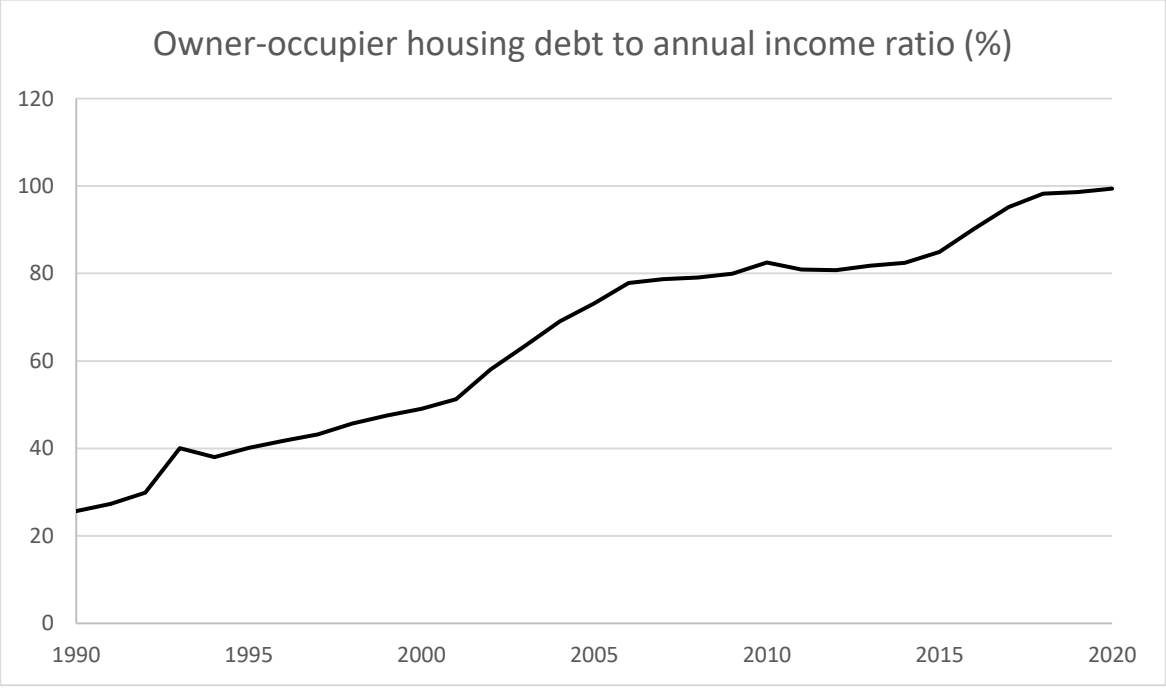
Appendix

Figure 4



Source: ABS

Figure 5



Source: RBA

Figure 6

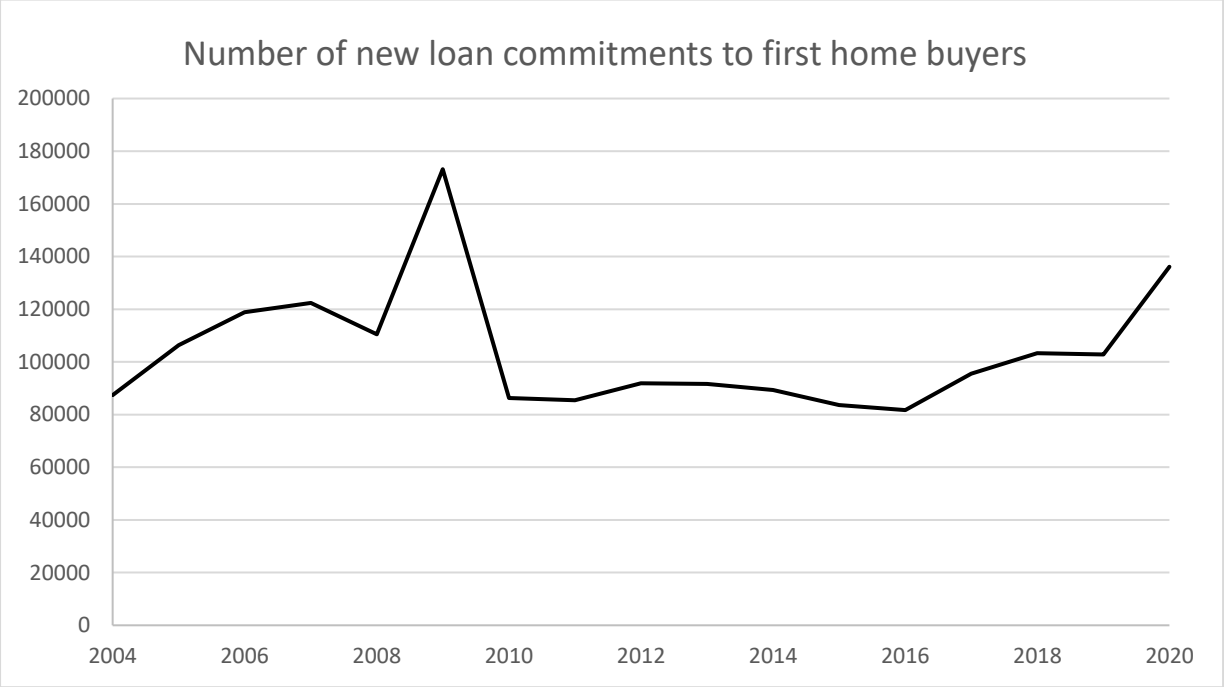


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Figure 7

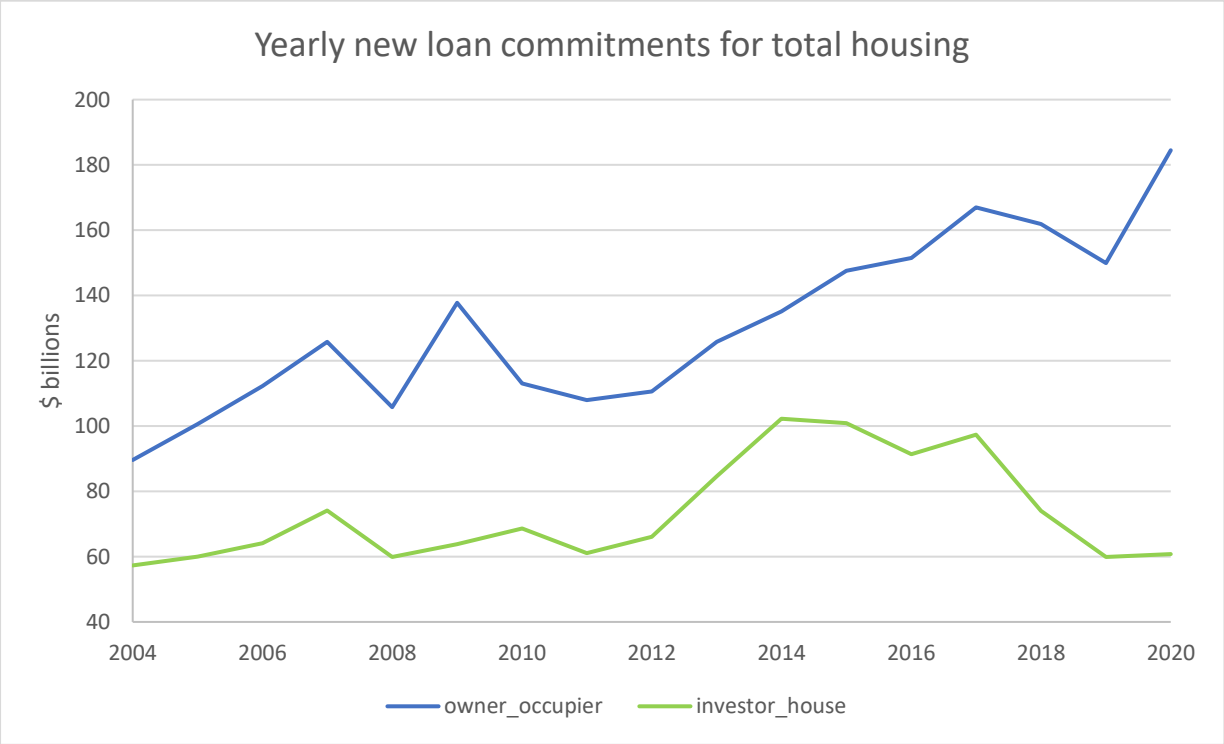

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Figure 8

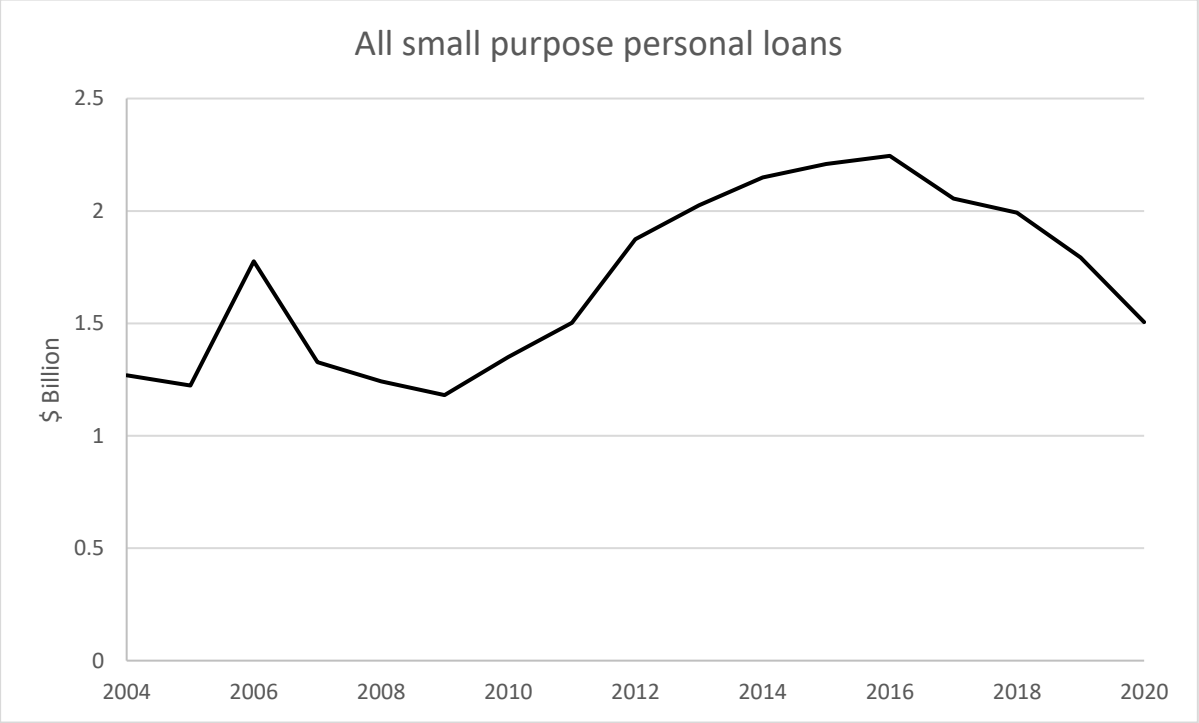

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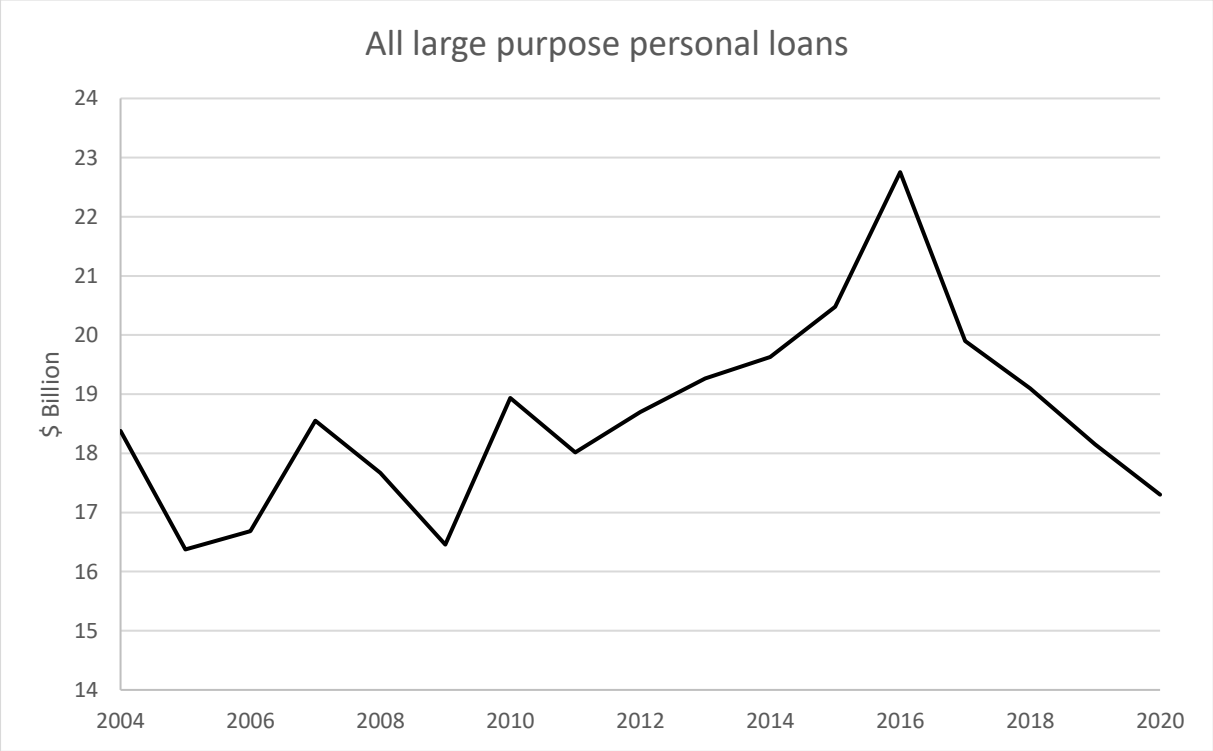
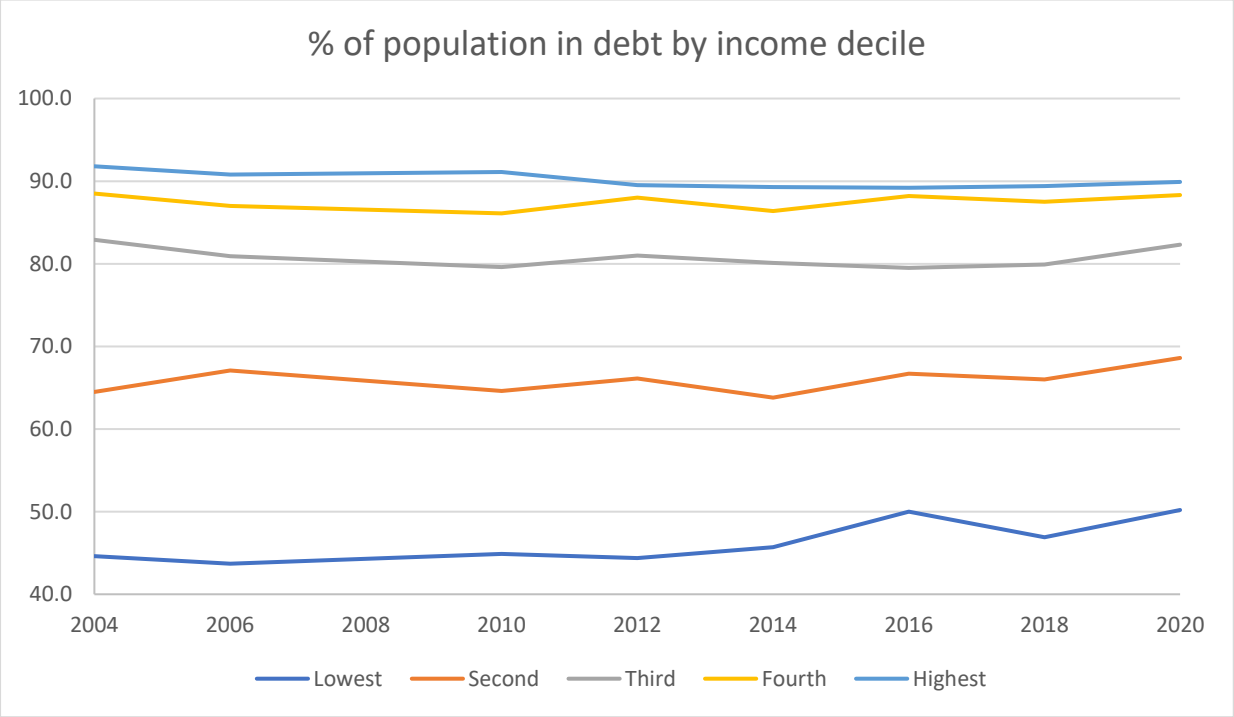
Figure 9



Source: ABS

Figure 10



Source: ABS

Table 1: Regression results showing the effect of a unitary change in the top 1% share of national income on domestic credit to private sector by banks in Australia

	Estimate	Std. Error	t value	p value
Intercept	-5416	346	-15.655	$< 2x10^{-16}$
Top 1% share of national income	2.650	0.9255	2.864	0.00703
Real interest rate	-0.02615	0.2735	-0.096	0.92438
GDP growth	-0.4432	0.5134	-0.863	0.39394
Year	2.740	0.1768	15.498	$< 2x10^{-16}$

Table 2: Regression results showing the effect of a unitary change in the Gini index on domestic credit to private sector by banks in Australia

	Estimate	Std. Error	t value	p value
Intercept	-5862.8899	391.0997	-14.991	$1.41x10^{-6}$
Gini index	3.5268	2.2134	1.593	0.155
Real interest rate	0.2077	0.8283	0.251	0.809
GDP growth	-0.4194	2.1788	-0.192	0.853
Year	2.9172	0.2196	13.282	$3.21x10^{-6}$

Table 3: Regression results showing the effect of a unitary change in the top 1% share of national income on the ratio of Australian household debt to income

	Estimate	Std. Error	t value	p value
Intercept	-5356.9979	622.7007	-8.603	4.41×10^{-9}
Top 1% share of national income	8.4738	1.8378	4.611	0.0000939
Real interest rate	-1.5921	0.7102	-2.242	0.0337
GDP growth	-0.3377	1.0826	-0.312	0.7576
Year	2.6995	0.3171	8.513	5.41×10^{-9}

Table 4: Regression results showing the effect of a unitary change in the top 1% share of national income on the ratio of Australian owner-occupier housing debt to income

	Estimate	Std. Error	t value	p value
Intercept	-4036	344.1	-11.730	6.93×10^{-12}
Top 1% share of national income	2.171	1.016	2.138	0.0421
Real interest rate	-0.6675	0.3925	-1.701	0.1009
GDP growth	0.09092	0.5982	0.152	0.8804
Year	2.036	0.1752	11.619	8.54×10^{-12}

Table 5: Regression results showing the effect of a unitary change in the top 1% share of national income on the yearly number of new loan commitments to first home buyers

	Estimate	Std. Error	t value	p value
Intercept	4240663	2519370	1.683	0.1181
Top 1% share of national income	-2248	8491	-0.265	0.7956
Real interest rate	-5840	2790	-2.093	0.0582
GDP growth	-12809	6559	-1.953	0.0746
Year	-2016	1251	-1.611	0.1332

Table 6: Regression results showing the effect of a unitary change in the top 1% share of national income on the yearly monetary value of new loan commitments extended to owner-occupiers

	Estimate	Std. Error	t value	p value
Intercept	-7584.6785	1535.5453	-4.939	0.000342
Top 1% share of national income	6.4935	5.1751	1.255	0.233454
Real interest rate	-1.8969	1.7005	-1.116	0.286468
GDP growth	-6.0795	3.9979	-1.521	0.154248
Year	3.8089	0.7626	4.994	0.000312

Table 7: Regression results showing the effect of a unitary change in the top 1% share of national income on the yearly monetary value of new loan commitments extended to investors in housing

	Estimate	Std. Error	t value	p value
Intercept	-2774.7280	1473.1530	-1.884	0.0841
Top 1% share of national income	14.3717	4.9648	2.895	0.0135
Real interest rate	2.8411	1.6314	1.741	0.1071
GDP growth	2.2320	3.8355	0.582	0.5714
Year	1.3246	0.7317	1.810	0.0953

Table 8: Regression results showing the effect of a unitary change in the top 1% share of national income on the yearly monetary value of all small purpose personal loans

	Estimate	Std. Error	t value	p value
Intercept	-124.92539	25.91093	-4.821	0.000418
Top 1% share of national income	0.28507	0.08733	3.264	0.006772
Real interest rate	0.05223	0.02869	1.820	0.093716
GDP growth	0.13864	0.06746	2.055	0.062309
Year	0.06101	0.01287	4.741	0.000480

Table 9: Regression results showing the effect of a unitary change in the top 1% share of national income on the yearly monetary value of all large purpose personal loans

	Estimate	Std. Error	t value	p value
Intercept	-436.16528	137.46700	-3.173	0.00803
Top 1% share of national income	0.41816	0.46329	0.903	0.38451
Real interest rate	0.41291	0.15223	2.712	0.01887
GDP growth	0.71028	0.35791	1.985	0.07054
Year	0.22193	0.06827	3.251	0.00695

Table 10: Yearly time trends of percentage of population in debt per decile

Income decile	Lowest	Second	Third	Fourth	Highest
Time trend	0.31	0.10	0.04	0.10	- 0.10