Earning dynamics and the distributional effects of monetary policy in New Zealand

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Abstract

This paper investigates the effect of monetary policy on the distribution of wealth using a stylised model of the New Zealand economy. The expected effect of monetary policy changes on the wealth distribution can vary in both sign and significance depending on the relative importance of the various transmission channels through which policy influences the economy in question. We build a Heterogeneous Agent New Keynesian (HANK) model capable of producing an endogenous distribution of wealth similar to its empirical counterpart, and examine how this distribution responds to monetary policy actions. To ensure consistency with the New Zealand economy we calibrate this HANK model to the distribution of New Zealand earnings data using microdata from Stats NZ's Integrated Data Infrastructure (IDI). The variation in this earnings data is then used to endogenously generate ex-post variation in the accumulation of savings, which generates a counterfactual wealth distribution. The calibrated model is then used to assess the significance of multiple distributional transmission channels of monetary policy in New Zealand, as well as the net effect on wealth inequality.

1. Introduction

Income and wealth inequality have become a greater concern to citizens in New Zealand and overseas over the prior 20 years, with many measures of both either elevated or rising since the start of the millennium. During the same period monetary authorities have had to wrestle with formulating policy in an environment of low, and falling, nominal interest rates - with the increasing use of alternative monetary policy instruments (e.g. Quantitative Easing) as a means to ensure inflation and maximum sustainable employment targets are met. However, this has led to the question of whether monetary policy - both in terms of monetary easing in the face of slowing economic growth, and in terms of the alternative instruments used, has been one of the causes of rising wealth inequality.

In this paper we investigate the effect of monetary policy on the distribution of wealth using a stylised model of the New Zealand economy. We build a Heterogenous Agent New Keynesian (HANK) model in which individuals make savings decisions that are based on a precautionary savings motive stemming from the lack of insurance, e.g. due to borrowing constraints in situations where a low realisation of labour productivity occurs. Agents facing a series of positive shocks accumulate wealth in government bonds, while those facing negative shocks draw down their holdings or borrow. Our model closely follows methods described in Ahn et al (2017) and Kaplan et al (2018). Approaching this question through a modelling lens is essential due to the lack of household level wealth data at frequencies relevant for monetary policy.

We use administrative data on earnings from Stats NZ's Integrated Data infrastructure (IDI) to calibrate the dynamics of uninsurable labour income risk in the model. We find that the model is capable of producing an endogenous distribution of wealth similar to its empirical counterpart, and examine how this distribution responds to monetary policy actions.

Following the survey in Leong (2021), we use the model to evaluate the relative strengths of various distributional channels of monetary policy by decomposing savings across the distribution into various components. By doing so, we find evidence of strong savings redistribution and income composition channels in New Zealand driving the response of

overall inequality. The earnings heterogeneity channel through wages and working hours is found to be comparatively weak, in contrast with international literature (Krueger et al (2016), Kaplan et al (2018)).

2. Data and earning process estimation

We use the Employer Monthly Schedule (EMS) administrative data from the IDI, Stats NZ. This data is used to produce the filled jobs and gross earnings indicator series, published four to five weeks after the end of the reference month. We use individual level annual gross earnings from all jobs filled by the wages and salary earners. We also convert nominal earnings into real values using CPI adjustment. Gross earnings correspond to the amount paid to all employees in the reference month. It excludes retirement payments, redundancy payments, and employee benefits.

Following recent literature (Guvenen et al (2015)), we calibrate labour outcomes in the model to match moments of changes in log earnings at one year and five year horizons. We focus on first four moments of earnings changes over the life cycle, shown in Table 1.

Table 1. Moments of earnings

moments t-5 for years 2019-2014				
n = 1769952	mean	SD	skewness	kurtosis
log earnings	0.319	1.283	0.147	9.724
moments t-1 for years 2019-2018				
n = 2353800	mean	SD	skewness	kurtosis
Log earnings	0.074	0.861	-0.278	15.502

Figures 1.1 and 2.1 in the appendix give a visual representation of the estimated earnings process for New Zealand and compare it to its US counterpart from the literature. Table 2 demonstrates that the model is capable of endogenously generating a distribution of wealth similar to that in either country when calibrated with the respective earnings process.

Table 2. Model Fit.

	US		NZ	
	Data	Model	Data	Model
Wealth Gini	0.77-0.78	0.76	0.68-0.69	0.6
Income Gini	-	-	0.43	0.54
Wealth quintile 1	(-0.2)- (-0.9)	-0.4	-0.1	0.64
Wealth quintile 2	0.8-1.2	0.4	2.7	3.8
Wealth quintile 3	4.4-4.6	3.5	8.7	11.6
Wealth quintile 4	12.0 - 13.0	14.8	18.7	24.4
Wealth quintile 5	82.5-82.7	81.7	69.9	60

3. Distributional Impacts of Monetary Policy

We now consider the model-implied impact of a surprise 25bp cut in the official cash rate on aggregate variables as well as the distribution of wealth in New Zealand.
Figure 1 shows that the reduction in the cash rate has a standard impact on common economic aggregates - increasing inflation, boosting consumption, and supporting output.

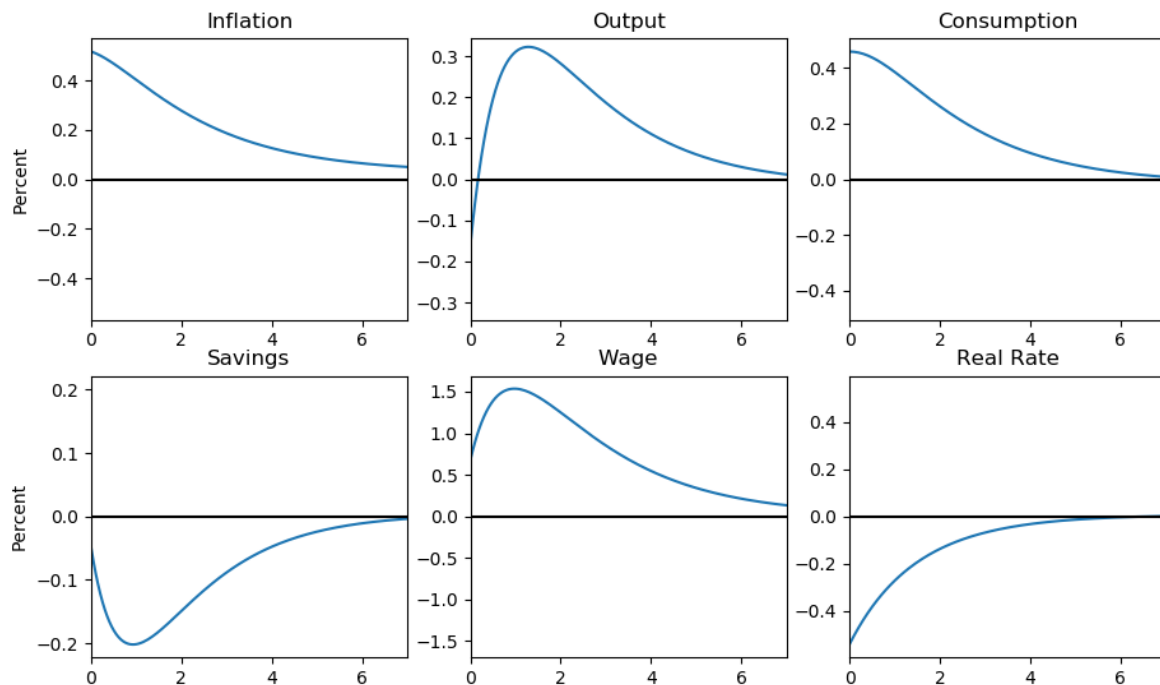Figure 1. Impulse responses to a 0.25 pp cut in policy rate

Figure 2 indicates that a monetary easing leads to a reduction in overall wealth inequality in the model economy, reflected in a sharp decline in the wealth Gini coefficient over the five quarters following the shock. At its lowest, the Gini declines by 0.5% relative to its steady state value, a magnitude in line with other macro aggregates. After the fifth quarter following

the shock, wealth inequality begins to rise back to its steady state level. The impact of the shock on the wealth Gini is persistent compared to the impact on other aggregates, with the Gini still 0.2% below steady state 8 years after the shock hits.

Figure 2. Response of the Wealth Gini

Wealth Gini Response
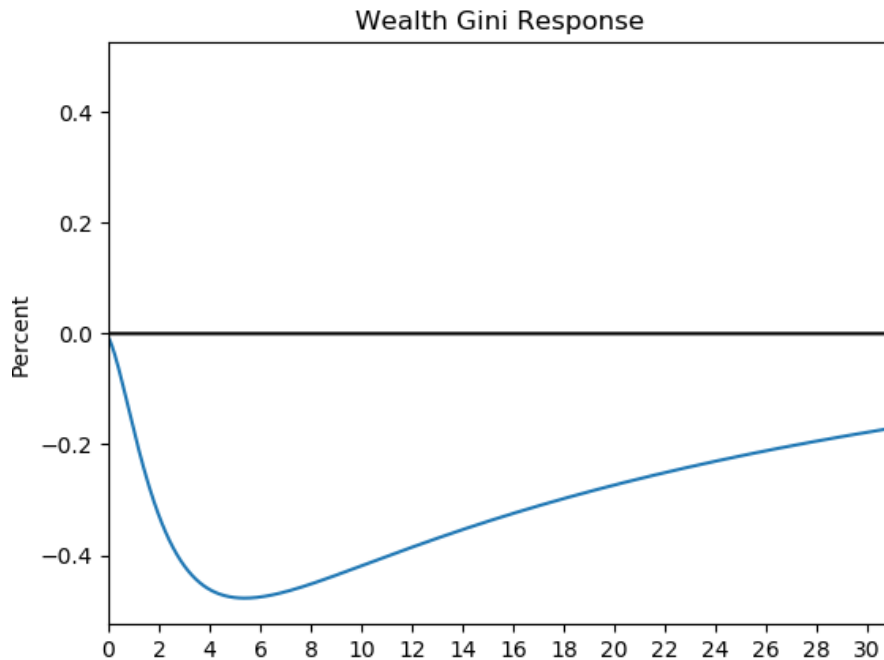
To further elaborate on the distributional dynamics following the shock, Figure 3 plots the share of wealth held by each wealth quintile. The model suggests that the share held by the wealthiest 20% of individuals in the economy declines persistently by 0.33% following the easing, while the share held by the poorest 20% remains essentially unchanged. The share held by all other cohorts increases by 0.07% to 0.15%, with the wealthier individuals gaining a larger share than the less wealthy ones. Following the fourth quarter this change in the wealth shares stabilises, reflecting the persistence in the Gini coefficient above. As shown in the Appendix, these adjustments correspond to a very slight retraction of the wealth Lorenz curve towards the line of total equality, although the effect is visually almost imperceptible.

Figure 3. Wealth held by Wealth quintiles

Wealth Share Held By Quintiles
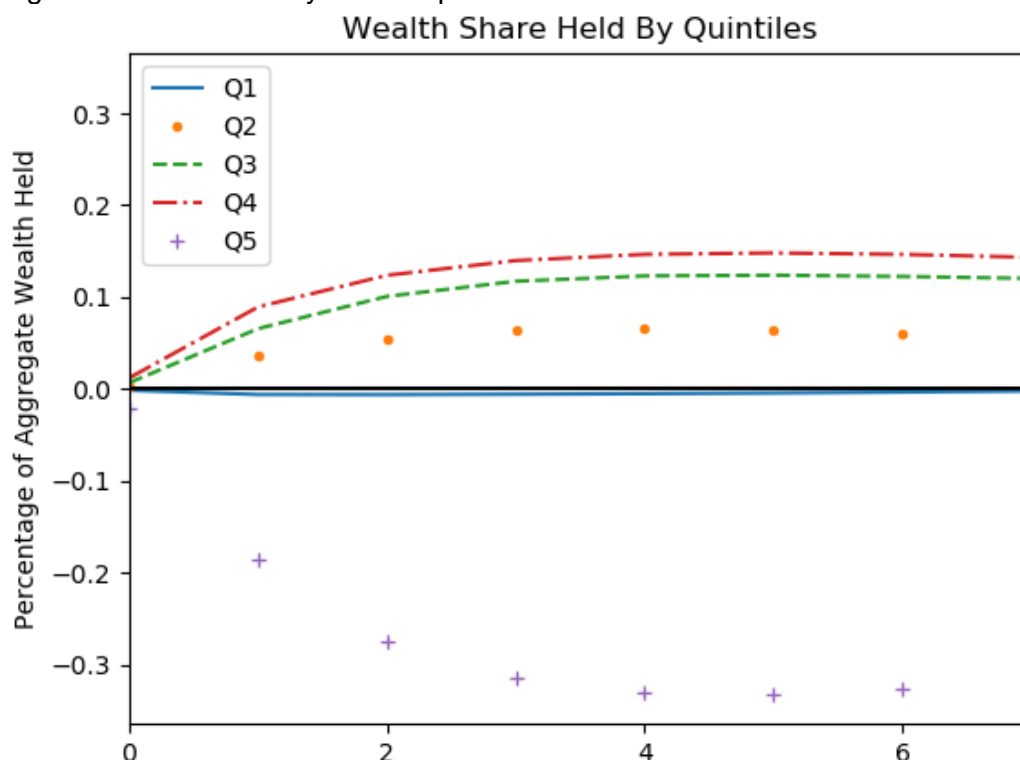
## 4. Distributional Transmission Channels of Monetary Policy in New Zealand

In order to better understand the transmission of the monetary shock to inequality in the previous section, Figure 4 breaks down the response in savings behaviour of individuals across the wealth distribution into the components of income and expenditures present in the model. These components include interest received on savings or paid on debt, wages, dividend payments from firm ownership, lump sum transfers from the government, and consumption.

The plot shows that the reduction in inequality is primarily due to a reduction in interest payments received in the top quintiles. This fall in the income from savings is accompanied by a reduction in firm profits and an increase in consumption by all households, leading to a net negative relative savings rate in the top three quintiles, the effect being strongest for the wealthiest.

While an increase in wages offsets some of the reduction in interest income in the top four quintiles, this indirect effect of policy is small, suggesting that households elastically adjust hours worked in response. In the absence of a strong effect from the labour market, the most important positive contribution to household income at the low end of the distribution is an increase in government transfers made possible by the decline on interest it has to pay on debt.

The above observations suggest that there are strong savings redistribution and income composition channels of monetary policy in New Zealand which tend to reduce wealth inequality following an expansion. While there is an offsetting contribution from the earnings heterogeneity channel which tends to increase inequality by pushing up wages at the top end, it is far weaker than the other two, so the net impact is a reduction in inequality.

Figure 4. Decomposing Wealth effects

Components of Savings Rate on Impact by Quintile
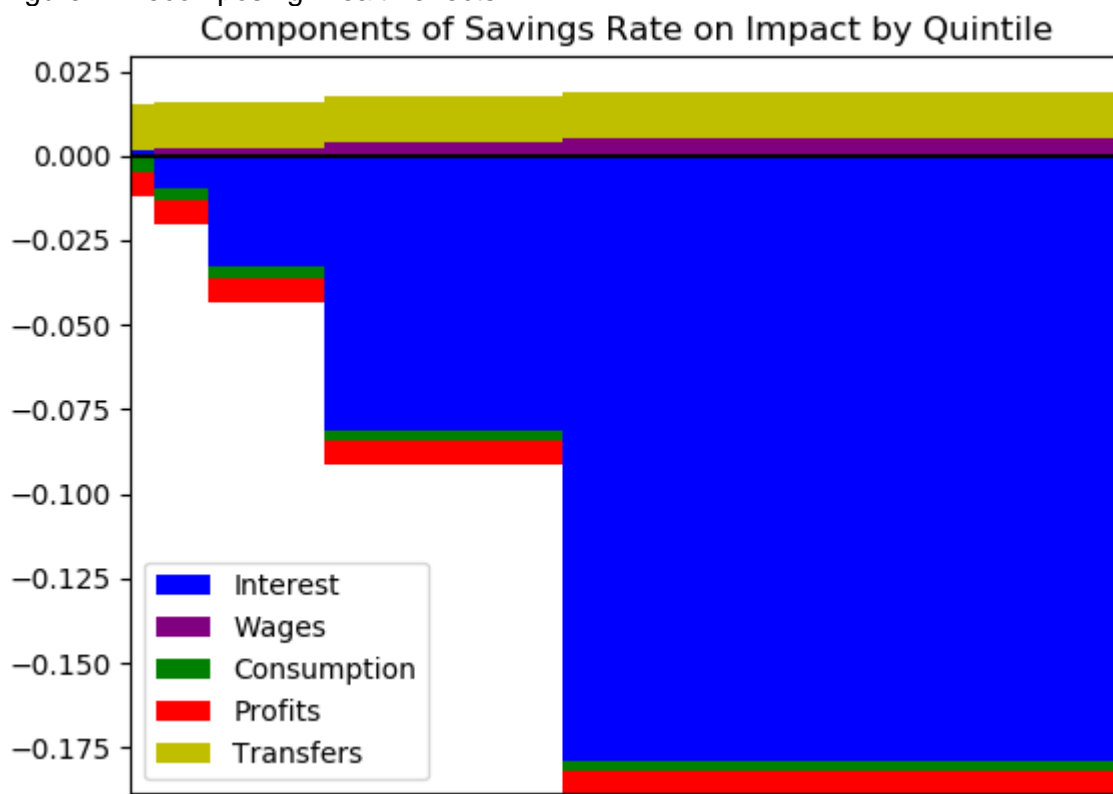
5. Limitations of this Analysis

While the above analysis provides an initial assessment of the distributional impact and channels of monetary policy specific to New Zealand, there are a number of caveats to the observations made above.

Firstly, while three of the four distributional channels of monetary policy cited in Leong (2021) have been assessed, the asset structure of the current model is not rich enough to evaluate the potentially critical portfolio composition channel.
In particular, households are not able to adjust to a monetary easing by taking out long term debt or investing in riskier assets.

A lower OCR reduces the opportunity cost of buying non-bond assets, which leads to a capital gain for existing asset holders. The "true" change has elements of both.
In our model individuals holding existing bonds do not receive a "capital gain" from those bonds due to the price rising on secondary markets. There is only a single bond price and that it is the coupon payment of the bond adjusts (rather than the price of the bond itself). So when this occurs with the overall value of bonds fixed, it then essentially lowers the coupon payments when the OCR falls.

In this case our model assumes that the bond matures immediately, in which case there is no secondary market, and whether the interest rate change is due to a change in the bond price or coupon payment is irrelevant. As a result, our wealth distribution has no longer term assets that would provide a capital gain, making this a model of the wealth distribution in absence of these gains.

Given the importance of the housing market to policy transmission in New Zealand, it is also possible that this channel would present a significant offset to the reduction in inequality

found in current results. Indeed, the strong savings redistribution channel suggests that there may be a strong incentive for households to rebalance.

Secondly, while monetary expansions appear to have persistent equalising effects, the model prediction is an equally persistent increase in inequality periods of tightening. Consequently, it cannot be concluded that monetary policy unconditionally reduces inequality.

Lastly, the assumptions regarding fiscal policy used in the above analysis were extremely simple, consisting of a flat labour income tax and lump sum transfers to households by a government passively balancing the budget. There is a growing consensus that fiscal assumptions are key for robustly assessing the effect of policy on inequality, and the above results may also adjust if these assumptions are brought closer in line with reality.

6. Conclusion

The paper investigates the effect of monetary policy on the distribution of wealth using a stylised model of the New Zealand economy. Approaching this question through a modelling lens is essential due to the lack of household level wealth data at frequencies relevant for monetary policy.

We find that a 25 basis point reduction in the OCR, leads to a drop in wealth inequality (Gini coefficient) by approximately 0.5 percentage points. This drop occurs gradually and reaches its trough after 5 quarters, remaining persistently lower thereafter.

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Appendix

Figures 1.1 and 2.1 below refer to the labour productivity associated with different ex-post labour productivity distributions, and their frequency in the population. Both New Zealand and the US are noted for comparison purposes.

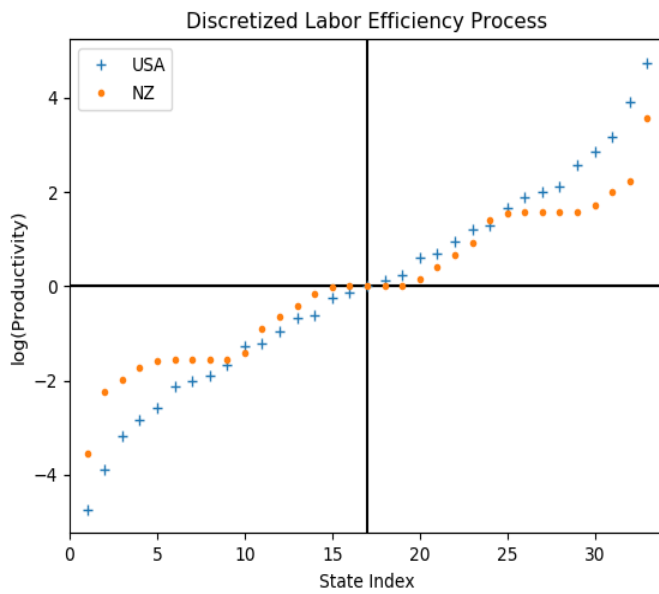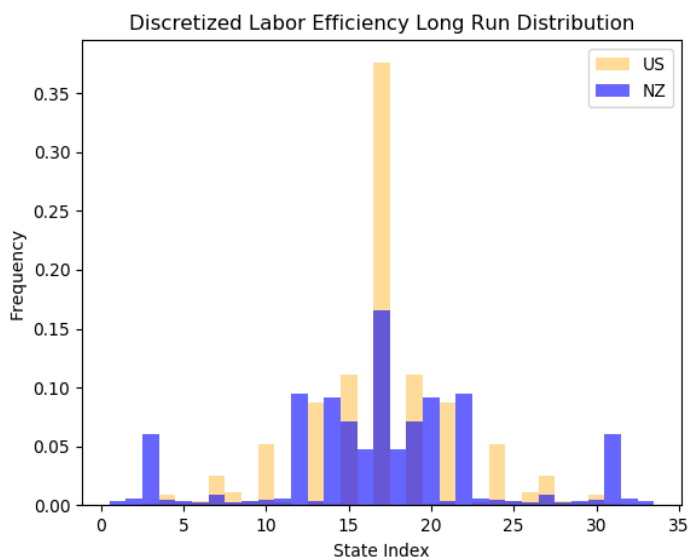Figure 1.1 Discretized labour efficiency process

Figure 2.1 Discretized labour efficiency long-run distribution

State index refers to the realisation of labour productivity – from low to high. In Figure 1.1 the productivity associated with these states is relatively flatter in New Zealand (as shown by the orange dots), with the change in productivity moving between states smaller through most of the realisations in New Zealand. However, at the tails there are sharp changes in productivity in the New Zealand distribution, even compared to the US distribution.

This can be viewed as three "levels" of productivity, where the productivity realisation in New Zealand is relatively flat over a number of state indexes, while the US has a more linear progression with a gradual increase in productivity as the states increase.

From Figure 2.1, the frequencies of individuals in the productivity states is significantly less spread in the US, with a sizable frequency at the mid-point. However, this needs to be read alongside the prior graph – where the New Zealand productivity states were "flatter" toward the middle of the distribution. As a result, this greater spread in the middle of the distribution does not imply a larger spread in productivity outcomes.

However, the "tails" of the frequency distribution are larger than in the US case – indicating that there are more cases of high and low productivity in the resulting productivity distribution. These larger frequencies do not occur at the very edge of the distribution however, and since the low and high productivity states were still close to the "low" and "high" levels (rather than the sharply different outlier productivities) where this density occurs this does not refer to particularly low or high productivity relative to the US.

The reduction in wealth inequality can be illustrated through the Lorenz Curve for wealth. This orders individuals by their wealth level, and then illustrates the cumulative share of wealth up until that individual - thereby giving a perspective on inequality in the wealth distribution. Figure 5 shows that the Lorenz curve is little changed following the reduction in the OCR, and thereby the effect on inequality is relatively limited.

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