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Save now, prosper later

A CGE investigation of increased rates of saving – additional scenarios

An NZIER report to the Savings Working Group, March 2011

About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER is also known for its long-established Quarterly Survey of Business Opinion and Quarterly Predictions.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form, and at the right time, for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review at various stages through a project by a senior staff member otherwise not involved in the project.

NZIER was established in 1958.

Acknowledgements

This report to the Savings Working Group follows on from preliminary analysis undertaken by NZIER in November 2010, see NZIER Viewpoint, Working Paper 2010/2.

Authorship

This report has been prepared at NZIER by James Zuccollo and James Allen, and reviewed by Jean-Pierre de Raad, March 2011

Key points

New Zealand's current savings

New Zealand's rate of saving is such that we cannot finance our investment from domestic savings. Whatever the cause the consequence is that for decades we have needed to borrow extensively from overseas, and our net foreign liability has risen to 86% of GDP. This debt exposes us to external economic and financial shocks and raises the country's risk premium.

Improved saving would reduce our external exposure

This paper uses NZIER's dynamic Computable General Equilibrium (CGE) model of the New Zealand economy to conduct an investigation into how an increase in national savings would affect GDP and living standards. We do not specify how this increase might take place.

We find that increased saving would reduce our overseas debt and thus cut our debt servicing repayments. It is likely that the risk premium on borrowing costs would also fall, which would increase investment and, thus, our capital stock and productive capacity.

Higher saving rates come at a short term cost to households…

If households are saving more of every dollar earned, then spending must decrease. Reduced spending depresses household consumption and GDP for some years. The induced depreciation of the exchange rate also increases the cost of imports; however, it does allow export industries to boom as the nation pays down its overseas debt.

…but increase future incomes

A larger pool of domestic savings means that we are less reliant on overseas borrowing for investment purposes. Our offshore interest repayments fall by up to $10 billion per year by 2025, which increases national incomes and consumption.

A rebalancing of the economy

The initial decline in the exchange rate drives the economy to become more export driven. However, this medium-run impact is finite: as interest repayments reduce our offshore debt the exchange rate would recover and prevent a long-run re-balancing of tradeables and non-tradeables. The increase in domestic incomes due to lower debt repayments also encourages more spending on non-tradeables, which reinforces the exchange rate's impacts on re-balancing the economy.

Cheaper borrowing costs boost investment and productivity…

If New Zealand is less indebted to the rest of the world, the risk premium on borrowed funds should drop, making investment more attractive. Our modelling shows New Zealand's investment increasing by up to 10% by 2025 if we can stabilise our ratio of net foreign liabilities to GDP at around 90%. This expands the capital stock in the economy, pushing up New Zealand's productive capacity. As New Zealand workers now have a deeper capital stock to work with, they too become more productive, which increases real wages.

…but it affects production more than consumption

If we assume that the national risk premium is little affected by the reduction in our foreign debt then the cost of capital will not change as we save more. The effect is to reduce the level of investment possible and reduce the economy's productive capacity, relative to the scenario where capital costs drop. Nonetheless, the decrease in interest payments on foreign debt allows

the nation to consume at a higher level in the future than previously. The increase in future consumption allowed by increased saving is not predicated on a reduction in our risk premium; however, increases in future production are.

New Zealand's GDP increases and households are better off

The overall effects of the scenario in which we stabilise our foreign debt ratio are that:

- New Zealand's GDP would be up to 4% higher in 2025 than it would otherwise have been owing to the lower cost of capital and increased investment.
- Gross National Disposable Income would be up to 6% higher in 2025 than it would otherwise have been.

This indicates that lifting national savings in a way that reduces net foreign liabilities could make a positive contribution to improving living standards in the long run.

The size of the impact depends on how much saving changes

The other scenarios computed demonstrate that, when larger changes in New Zealand's saving rate are modelled, the story remains the same but the impacts are proportionately larger. For example, to match Australia's level of net foreign liabilities within a decade would require domestic saving to rise by 8% of GNDI. The increased change in saving then has a greater impact on the cost of capital and interest repayments, which causes GDP to rise by 10% and GNDI to rise by 15%.

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1. Objectives of research

> *"Increasing our national savings and investment levels is a critical issue for New Zealand, because of our heavy reliance on foreign capital. This has produced high and rising debt to the rest of the world, which cannot continue… So we have a big task to turn around this economy and rebalance it towards savings and growth."* [1]

Most economists understand the importance for New Zealand's longer term growth prospects of achieving a sustainable balance between domestic savings and offshore borrowing. But what would be the likely economic consequences of a change in the national saving rate?

This paper examines how improved national savings could benefit the New Zealand economy in the long term, using NZIER's dynamic computable general equilibrium model of the New Zealand economy. It extends NZIER's previous working paper[2] by revising the baseline projections and considering a wider range of scenarios in greater depth.

We do not debate the extent of New Zealand's saving problem. There are conflicting perspectives on this. NZIER has previously published or contributed to research trying to address this question.[3] Nor do we speculate on the precise mechanism that might be used to increase national savings (paying down government debt, compulsory savings schemes, enhancements to Kiwisaver, improved financial literacy, etc): we focus solely on the economic outcomes of an assumed increase in national savings.

1.1 Why might we wish to increase savings?

Persistent current account deficits indicate that New Zealand's current rate of saving is such that we cannot finance our investment from domestic savings. A consequence of the persistent deficit is that our level of net foreign liabilities (NFL) has been steadily rising over the past decade or so. It currently sits at 86% of GDP (see Figure 1), and Treasury projected it to exceed 100% of GDP by 2014.[4]

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[1] Bill English. 'Wide brief for expert group on savings options'. National Party media Release, 24 August 2010. http://www.beehive.govt.nz/release/wide+brief+expert+group+savings+options

[2] NZIER (2010) *'Save now, Prosper later'*, NZIER Working Paper 2010/2

[3] Le T. 2007. Does New Zealand have a household savings crisis? NZIER working paper, www.nzier.org.nz; Wilkinson B & Le T. 2008, Is poor household saving the cause of New Zealand's high current account deficit? NZIER working paper, www.nzier.org.nz, Le T, Gibson, J, Stillman S. 2010. "Household Wealth and Saving in New Zealand: Evidence from the Longitudinal Survey of Family, Income and Employment". Motu working paper 10-06

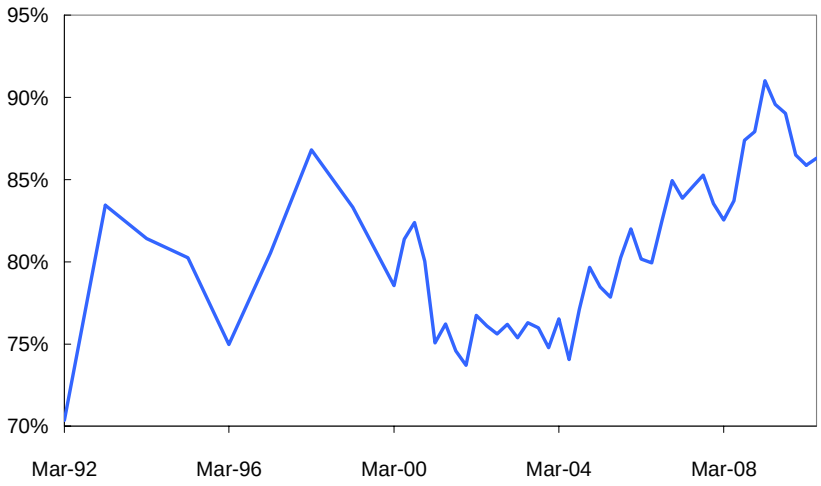
[4] Treasury (2010), Saving in New Zealand – Issues and Options, New Zealand Treasury, September

That level of liability has two related consequences:

- It makes the economy vulnerable to economic events that might cause investors to withdraw from New Zealand, such as a major biosecurity scare or the European sovereign debt crisis; and,
- It may raise interest costs (and so affect investment decisions) because high indebtedness usually attracts a risk premium in financial markets.[5]

Figure 1 New Zealand's foreign debt

NFL as a percentage of GDP



Source: Statistics NZ, NZIER

Reducing the level of NFL will reduce the macroeconomic risks mentioned above and one possible way to reduce NFL is to increase national savings.

[5] An alternative view is that high interest rates are not due to a country risk premium but to the policy response to contain inflation, where imbalanced domestic spending can continue to be supported by an inflow of funds from overseas investors seeking a high yield currency. Labuschagne N & Vowles P. 2010. Why are real interest rates in New Zealand so high? Evidence and drivers. NZ Treasury Working Paper 10/9

2. Approach

We use our dynamic computable general equilibrium (CGE) model of the New Zealand economy to estimate the effects of an increase in the saving rate.

2.1 The MONASH-NZ CGE model

The MONASH-NZ dynamic CGE model contains information on 131 industries and 210 commodities. Our model was developed in close collaboration with the Centre of Policy Studies at Monash University, a global leader in building and applying CGE models to assessing policy and industry questions. The model captures the various links between industry sectors and households (via the labour market), the government, capital markets and the global economy (via imports and exports).[6]

The two key advantages of a dynamic CGE model over alternatives, such as input-output models, are that they allow us to consider resource reallocation in response to price changes and they can take into account the timing of the impacts on the economy. For more details on the model see Appendix A .

2.2 Modelling scenarios

NZIER's CGE model works by comparing what would happen if the New Zealand economy undergoes a significant change (the factual) with what would happen in the business as usual (BAU), or baseline, scenario (the counterfactual). The BAU scenario in this research is a projection for the New Zealand economy out to 2025 using NZIER's *Quarterly Predictions* forecasts.[7]

We then introduce two significant changes (or 'shocks') to the BAU scenario to show the impact of increasing New Zealand's saving rate and reducing New Zealand's NFL. There are two variables in the model that we shock:[8]

- The saving rate (which reduces foreign borrowing); and,
- The cost of capital (as reduced exposure to economic shocks may lower the country's risk premium, and lower consumption reduces inflationary pressure).

2.2.1 Saving rate

The primary shock to the model is an increase in the rate of saving. We achieve that by exogenously decreasing the average propensity to consume (APC) out of gross national disposable income (GNDI) from the current level of 86%. The counterfactual

[6] For more detail on the model, see NZIER. (2009). 'Short term gain, long term pain? Impact of New Zealand's fiscal stimulus: A dynamic general equilibrium analysis'. NZIER Working Paper 2009/03.

[7] There are many different forecasts of NFL available from various sources but most predict that the current account deficit is likely to rise in the medium-run, although not all agree with the magnitude forecast by NZIER.

[8] In reality there would be further effects imposed by the mechanism used to change the saving rate. In this illustrative simulation we abstract from those issues and effectively assume that some means to increase the saving rate without 'side-effects' has been implemented.

scenario, in which the intervention does not occur, assumes that the APC remains constant over time and the ratio of NFL to GDP increases up to 115% of GDP by 2025.

We consider two scenarios for the increase in the saving rate.

a) Scenario 1: Stabilise the NFL at 90% of GDP

In the first scenario we target a rapid stabilisation of NFL at 90% of GDP. While the current ratio is below that level it is forecast to rise to well over that in future our scenario represents an increase in the ratio from the current level but a significant decrease relative to current forecasts (Figure 2 illustrates the difference).

The targeted change in NFL requires us to reduce the APC by approximately three percentage points between 2010 and 2012. That is, for every dollar of disposable income, an extra 3 cents is now saved instead of being spent. From there on we allow the economy to proceed as in the BAU case rather than continuing to manipulate the saving rate. That is to say that the APC remains three percentage points below baseline for the duration of the simulation. The rationale for our approach is that we are evaluating the impact of a hypothetical single policy intervention rather than a complex series of ongoing interventions that might maintain a constant rate of NFL to GDP.

b) Scenario 2: get the NFL to 60% of GDP, the same as Australia

The second scenario targets reducing New Zealand's NFL to GDP ratio down to 60% – approximately the same as Australia's present ratio – over the course of the next decade. In order to achieve the desired level of NFL we reduce NFL as a proportion of GDP by approximately three percentage points each year for the decade from 2010 to 2020. That requires us to reduce the APC down to about 78% of GNDI for the decade; an eight percentage point increase in the saving rate. Once the desired level of NFL has been reached we increase the APC to approximately 82% of GNDI--below its initial level--in order to maintain NFL at 60% of GDP.

Clearly the increase in savings required to attain Australia's level of foreign debt is unlikely to be achievable. Nonetheless we include this scenario for two reasons: first, it is useful to know what would be required to achieve that target and, secondly, it gives some idea of the differences that a major change in savings might produce.

2.2.2 Cost of capital

The cost of capital is likely to decline as New Zealand's risk premium drops with the reduction in the level of NFL. To model that, the second shock we impose is a change in the cost of capital.[9]

[9] For a discussion of the cost of capital in the baseline forecasts see Appendix 5.A.5.

a) Magnitude of decrease in cost of capital

We do not have robust empirical material on the relationship between NFL and New Zealand's country risk premium. A correlation of the mean values of NFL and money market rates between 1994 and 2004 by Rose (2009) indicates that were New Zealand to reduce its NFL to 60% of GDP, it might enjoy money market rates up to 100 basis points lower than the current base of 5.5%.[10] Rose's paper is not a causal analysis but the IMF gives similar estimates of 30 to 100 basis points, which gives us some confidence that the true value lies in that interval.[11] We take the midpoint of these estimates.

A 100 basis point drop from a level of 5.5% implies a reduction in our cost of capital of almost 18%, while a 30 point drop would reduce it by 5.5%. Hence, we assume the cost of capital will progressively fall by a cumulative 10% if the level of NFL drops to 60% of GDP. For a business facing a weighted average cost of capital of about 10% that would reduce their cost of capital by a whole percentage point.[12] Based on this line of reasoning we henceforth assume that a one percentage point change in the ratio of NFL to GDP causes a response of 0.4% in the cost of capital.

The first scenario – stabilisation of NFL at 90% of GDP – allows our NFL to rise slightly from the current level but it still remains 25 percentage points below baseline projections by 2025. Thus we reduce the cost of capital over the course of the simulation by a cumulative 10% relative to baseline. That is approximately equivalent to maintaining it at today's level.

In our second scenario – a reduction in NFL to Australian levels – similarly requires a reduction in the cost of capital but this time by a far greater magnitude. In that simulation the NFL to GDP ratio falls 55 percentage points below baseline, which implies a 22% reduction in the cost of capital by 2025. That is a 10% fall relative to the 2010 level.

Given the uncertainty of these estimates we also consider variations on the second scenario in which the cost of capital either declines by only half as much or not at all. Together those form our third scenario.

b) Timing of decrease in cost of capital

For each scenario we model the change in the cost of capital as a linear decrease over the course of the simulation as New Zealand's foreign liability diminishes. That assumes financial markets respond gradually to the changes in the risk premium as there is more certainty that the level of NFL will drop.

It could be argued that if the government announced some mechanism that would increase national savings by the required three percentage points each year, and that change was expected to persist, one might expect capital and equity markets to

[10] Dennis Rose, "Overseas indebtedness, country risk and interest rates," *Policy Quarterly* 5, no. 1 (February 2009): 3-9.
[11] Werner Schule, *New Zealand: Selected issues* (International Monetary Fund, April 2010).
[12] PricewaterhouseCoopers, *The Cost of Capital Report*, March 2010.

rapidly price in the future changes to New Zealand's risk premium and significantly reduce our cost of capital. However, there is rarely certainty of government policy over the course of a decade, particularly with topics as contentious as savings policies. As such, our approach of gradually decreasing the cost of capital seems justifiable.

2.2.3 Scenario summary

As discussed above we have constructed three scenarios to model and report on. Table 1 summarises them.

Table 1 Summary of scenarios

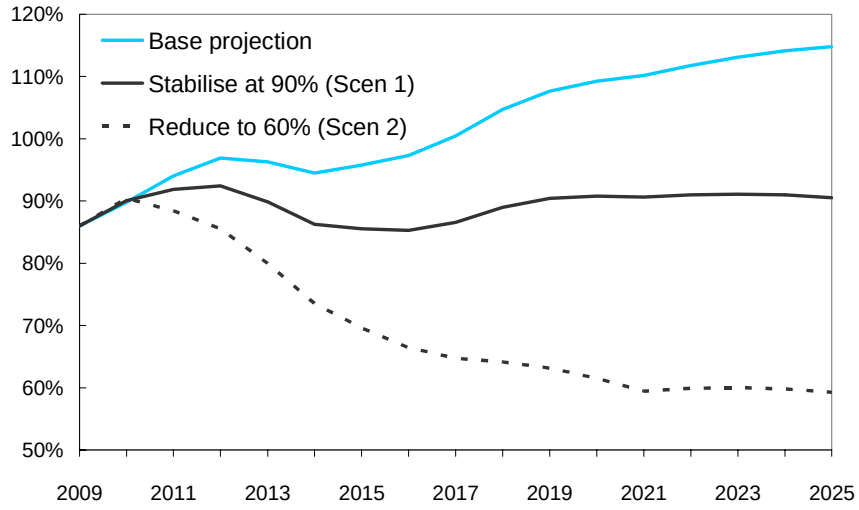
Scenario	Description	Saving rate	Cost of capital
1	Stabilisation of NFL	Adjust to rapidly stabilise NFL at 90% of GDP	Decrease by 10% relative to BAU over course of decade
2	Reduction of NFL to Australian levels	Adjust to decrease NFL to 60% of GDP by 2020	Decrease by 22% over course of decade
3	Sensitivity of results to smaller changes in the cost of capital	Adjust to decrease NFL to 60% of GDP by 2020	Either no change or decrease by 11%

Source: NZIER

The path of NFL as a percentage of GDP in each scenario is shown in Figure 2. Note that we did not attempt to smooth the business cycle impact from the base projections, which lends some ambiguity to the phrase 'stabilised at 90%'. In fact, NFL tops out at 92% in 2012, drops to 85% in 2016 and then stabilises at 91% from 2020 in scenario 1.

Figure 2 Ratio of NFL to GDP in each scenario

NFL as a percentage of GDP



Source: NZIER

2.3 Interpreting the results

2.3.1 Change from baseline

The CGE technique used by NZIER calculates impacts as changes from a baseline level of NZIER's Quarterly Predictions macroeconomic forecasts. Results are then reported as percentage changes from the baseline forecast. Where dollar values are reported they are calculated using the forecast future value of the variable; changes in forecasts will affect those dollar values.

This point is extremely important to bear in mind when reading the results of the scenarios below. In this modelling work the size of the impact is determined primarily by the reduction in the APC that is required for each scenario. That reduction is dependent on the projected future level of NFL and a different forecast would change the baseline and therefore the magnitudes of the required APC reduction and the results. Nonetheless, the effects described and the explanations for them would be similar.

It is also worth noting that the model assumes a constant population growth rate in line with Statistics New Zealand's current long term projections. That means population growth is built in to the baseline and any percentage change in the policy simulation for a macroeconomic variable will have a per capita effect of a similar magnitude.

2.3.2 Macroeconomic effects

We focus on key macroeconomic variables such as employment, Gross Domestic Product (GDP), consumption and gross national disposable income (GNDI), which is a measure of economic welfare (how 'well off' we are):

- GDP measures the physical amount of goods and services produced in the economy – it shows the size of the economy;
- GNDI measures the purchasing power of all New Zealanders' income. Because it measures income, rather than production, it is a better proxy for welfare than GDP.

The scenarios will have differing impacts on these two measures, and not necessarily in the same direction.

3. Results

The results are presented by scenario but explanations are not duplicated where they are applicable to all scenarios. While the explanations of the effects remain the same the magnitude of them varies markedly between the scenarios, depending on the size of the shocks. Readers interested in the results of the later scenarios are thus advised to read from the beginning.

3.1 Scenario 1: stabilising New Zealand's debt

The first scenario targets stabilising New Zealand's foreign debt at 90% of GDP, slightly above the current level of 86%.

3.1.1 Direct impact

For this scenario we reduce the APC by 3 percentage points in order to retard the growth of NFL such that it tops out at 92% of GDP and finally settles at 91% by 2025.

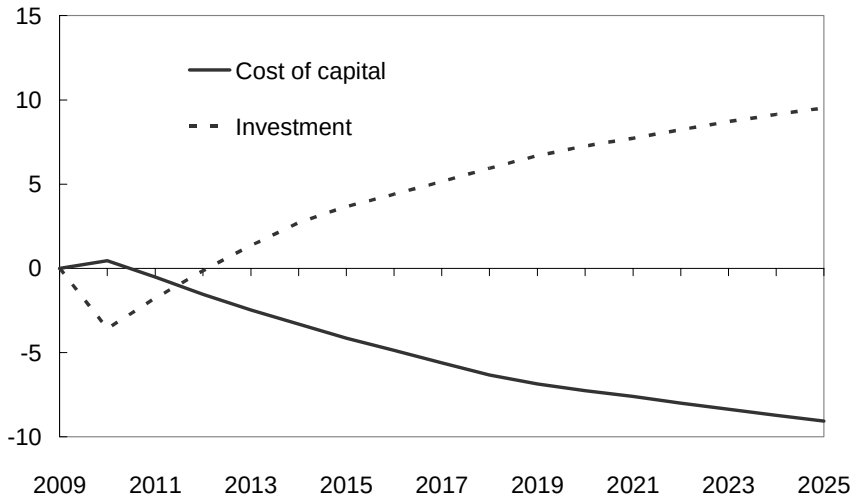
Increasing the saving rate reduces household consumption and increases the supply of domestic funds to the investment market. That in turn reduces New Zealand's reliance on overseas borrowing and allows us to pay down overseas debt relative to baseline projections, as shown in Figure 2 by the widening gap between scenario 1 and the baseline.

The decrease in NFL also reduces the interest payments that New Zealand makes offshore by up to $900 million per year by 2025, relative to current forecasts, as the debt to be serviced drops.

The second key element of this simulation is the progressive decrease in the cost of capital from 2011 onward. That boosts investment spending, as shown in Figure 3.

Figure 3 Change in cost of capital and investment – scenario 1

Percentage change from business-as-usual



Source: NZIER

This change is additional to the changes in the saving rate and generates investment that rises 10% above BAU by 2025. Note that the small increase in the cost of capital in 2010 happens before we shock it downward. It is a consequence of continued borrowing and household spending driving demand for investment in service industries.

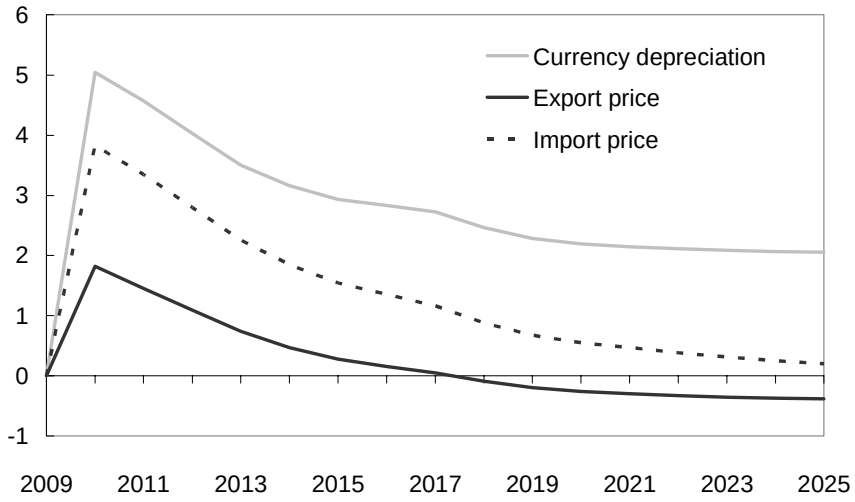
3.1.2 Paying off the debt

Reducing New Zealand's overseas debt (relative to BAU) has a significant impact on the currency: when the rate of saving is increased, New Zealand borrows less in net terms relative to baseline. What was previously a flow of money into the country becomes a flow out of the country as we repay debt.[13] That increases the supply of New Zealand dollars to foreign exchange markets and causes a depreciation of the currency.

The consequence of the depreciation is to make our exports more attractive to overseas buyers and boost demand for our exports, which increases both the price at which exports are sold and the quantity exported (see Figure 4 and Figure 5). Concurrently, the local price of imports rises due to the depreciation, which causes consumption of imported goods to fall.

[13] We assume for simplicity that New Zealand's foreign liabilities are charged interest at the average cost of debt. The corollary of this assumption is that debt and equity reductions are assumed to provide the same return when NFL are paid off.

Figure 4 Depreciation and the terms of trade – scenario 1
Percentage deviation from business as usual

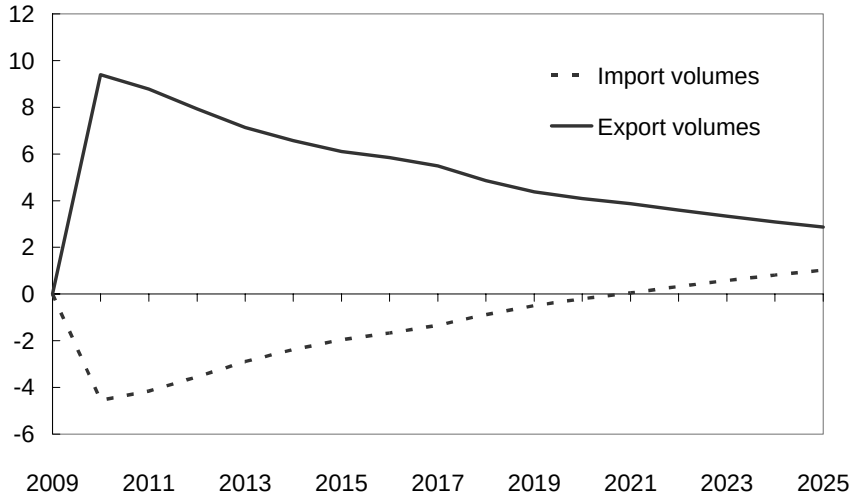


Source: NZIER

Both import and export prices rise, but the net effect is a fall in New Zealand's terms of trade. That is because the MONASH-NZ CGE model assumes imperfectly elastic demand for exports. The consequence of those assumptions is that the price of imports experiences the full effect of the currency depreciation while the effect on our export prices is dampened by an increase in export quantities. Thus depreciation has a negative effect on our terms of trade.

As we repay debt and reduce our NFL relative to BAU the interest repayments on that shrinking stock of foreign debt decline. The gradual decline in interest payments reduces the flow of currency out of the country and gradually causes the currency to appreciate over time, reversing the effects of the initial depreciation. Consequently, from 2011 onward, exports decline and import consumption increases relative to their initial peak; however, exports remain above BAU.

Figure 5 Trade volumes – scenario 1
Percentage deviation from business-as-usual

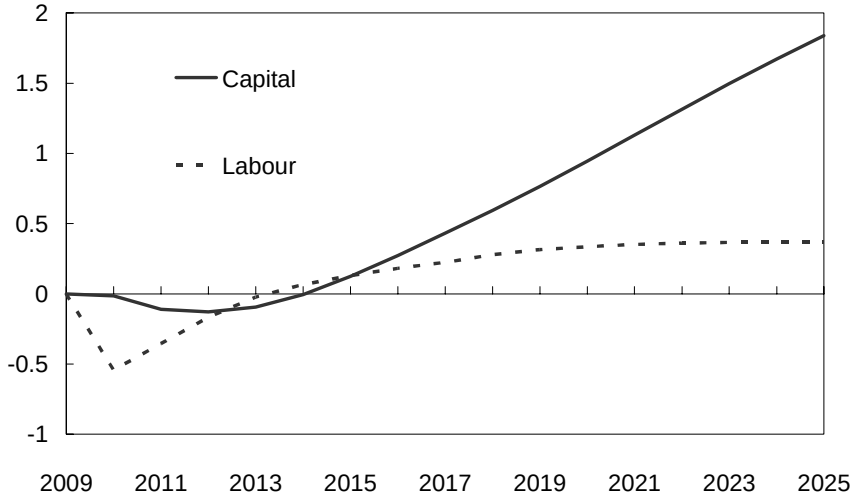


Source: NZIER

3.1.3 Increased capital intensity boosts incomes

The primary effect of the decreased cost of capital is to create a large quantity of capital that would otherwise have been unprofitable to invest in. Under our scenario, by 2025 the stock of capital in the economy has grown by 9.5% relative to BAU and continues to increase (Figure 3). That increased capital stock drives production growth and is responsible for nearly half of the increase in GDP as production becomes more capital intensive.

Figure 6 GDP contributions by factor cost – scenario 1
Percentage change in GDP due to each factor's income



Source: NZIER

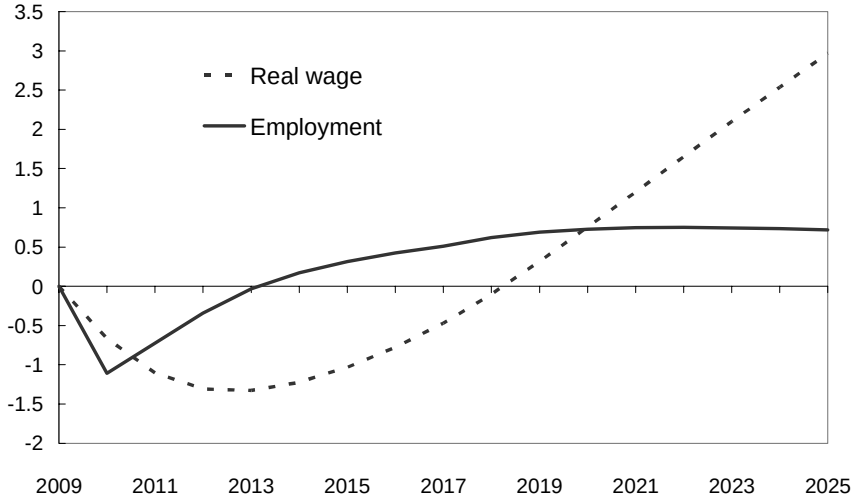
Figure 6 shows the change in the contributions of labour and capital to GDP. It clearly illustrates the growing reliance on capital in the production process as it

becomes cheaply available. Nonetheless, the returns to labour and land also increase over time as the available stock of capital rises.

The initial dip in capital and labour usage is due to the decrease in aggregate demand as consumers reduce spending and send savings offshore to repay national debt. The drop in aggregate demand induces a reduction in output and a corresponding fall in the returns to capital and labour. The short term dip in employment is clearly shown in Figure 7, which shows the change in the real wage and employment over time; the MONASH-NZ model incorporates a 'sticky wage' mechanism that is clearly visible.

Figure 7 Employment and wages – scenario 1

Percentage deviation from business-as-usual



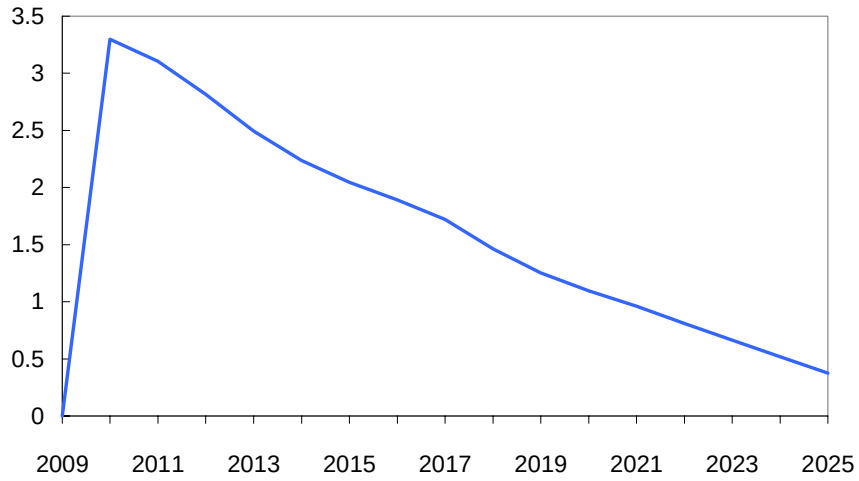
Source: NZIER

The initial drop in employment is a consequence of the fall in output; however employment immediately rebounds. The rebound is driven by the increase in investment: as the capital stock rises more labour is needed to make use of it. As the demand for labour rises the real wage slowly follows and, by 2014, the growing real wage starts to absorb the labour demand growth. By 2025 the real wage has risen by 3% in response to the increased effective marginal productivity of labour. If the simulation were to continue to run we would expect the real wage to absorb the entire demand increase and the employment level to return back to its natural rate.

3.1.4 Rebalancing the economy towards tradeables

At an industry level it is interesting to ask which industries are likely to expand, or contract, as a consequence of such a significant change in the economy. As might be expected, the greatest impact is upon export-facing industries in the tradable sector.

Figure 8 Change in net exports' share of GDP, scenario 1
Percentage point change in net exports share of GDP



Source: NZIER

In the short and medium run exports grow as the depreciation of the exchange rate make them more competitive overseas. That causes a shift in resources towards the tradable sector and exports initially grow as a share of GDP (Figure 8). This outcome is consistent with the Government's desire to see New Zealand's economic growth become more export driven. However, in the long run, the return of the exchange rate towards BAU means the export boom gradually declines, relative to the base projections.

Delving into the industry results in slightly more detail, there are three factors which drive the changes in total domestic production of goods and services:

- The local market effect: domestic demand for a product changes and more or less of it is consumed. This effect excludes consideration of whether it is produced domestically or imported.
- The domestic share effect: where local demand shifts between domestic production and imported goods due to relative price changes.
- The export effect: where domestically produced exports of a good or service rise.

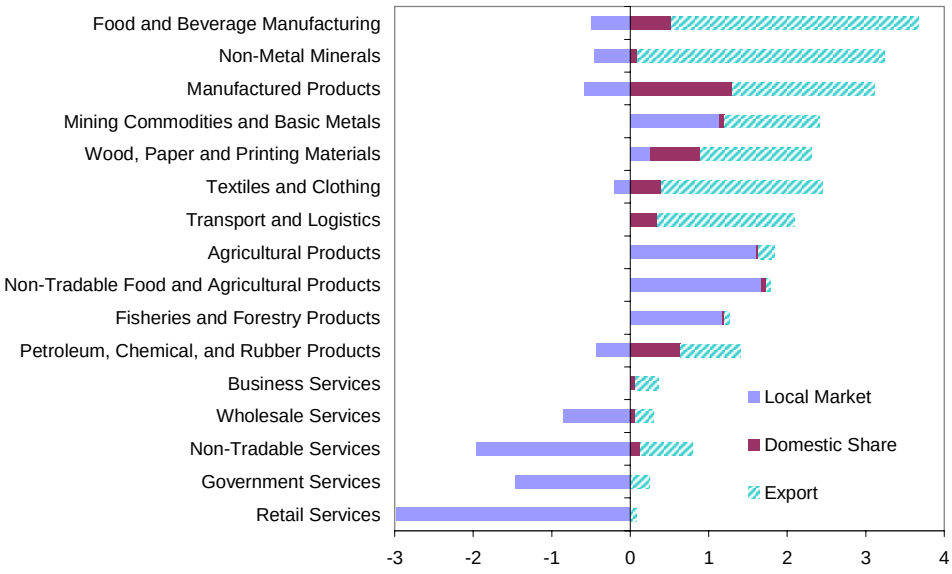
Figure 9 decomposes the impact of the initial currency depreciation on industries into the categories described above. We take a snapshot of domestic production in 2014 to capture the effects of the movement in the exchange rate on output.

The reduced APC has a major impact on household consumption with most local services suffering from reduced demand in the local market and languishing at the bottom of the table. In addition, the currency depreciation increases export competitiveness while making imports more expensive. As a result exports increase and domestic usage switches to domestic production.

In the middle of the figure are primary industries who gain in the local market from selling to export facing industries. Their expansion in the local market results from sales to intermediates rather than households. At the top of the figure are the industries who gain significantly from the increased demand for exports. Some industries, such as manufacturing, also gain domestic market share as imports become less competitive. Thus, the drop in the exchange rate moves the balance of output significantly (albeit temporarily) in favour of the tradable sector.

Figure 9 Decomposition of industry output effects in 2014 – scenario 1

Percentage change from business-as-usual in 2014

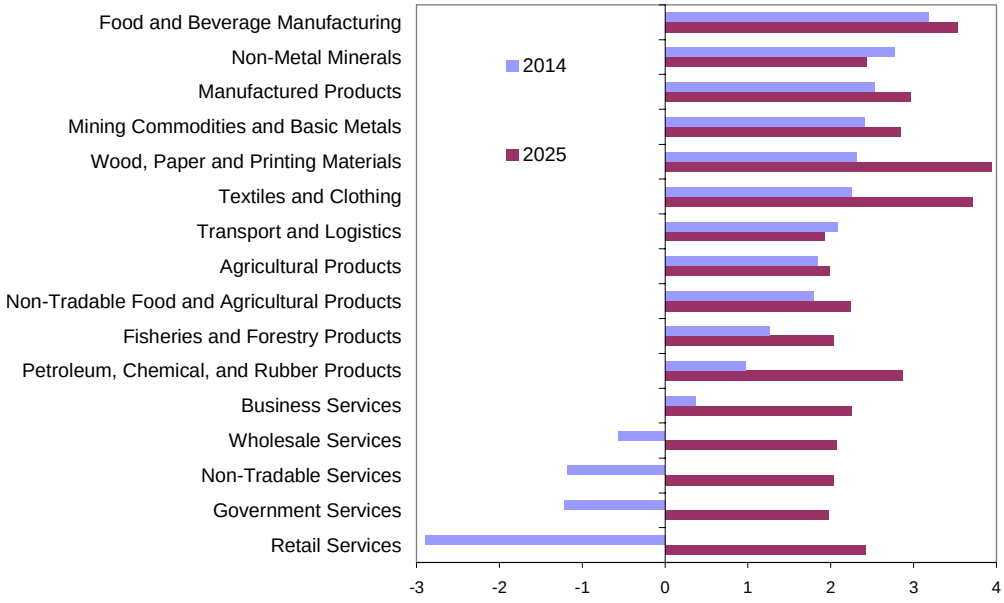


Source: NZIER

By 2025, domestic demand has increased when compared to the base scenario but the rise in the exchange rate back towards its baseline level (Figure 4) has simultaneously shifted output away from exports, relative to 2014.

Figure 10 compares the output of industries in 2014 with their output in 2025. With few exceptions the tradable sector has grown little between 2014 and 2025 while the local services have expanded hugely. That is due to the increase in domestic demand over that decade as declining interest repayments cause incomes to rise.

Figure 10 Industry output 2014 vs 2025 – scenario 1
Percentage change from business-as-usual



Source: NZIER

Ultimately, the rebalancing towards tradeables does not persist once the economy has moved to a new equilibrium. Rather, the tradeables sector grows relative to non-tradeables initially and then the non-tradeable sector catches up as the economy approaches a new equilibrium. However, the transition time of 10-15 years is significant and these transition impacts should not be ignored. Additionally, the transition time and magnitude of the impact will depend upon the particular change in the savings rate.

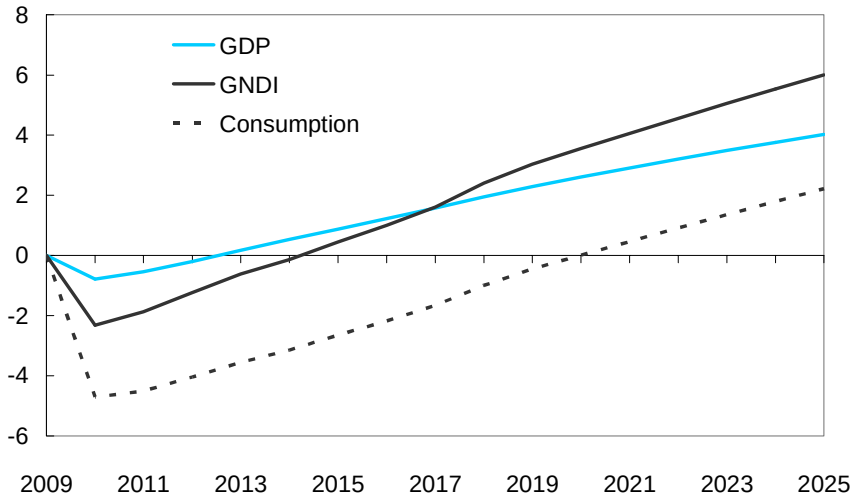
3.1.5 Enjoying the gains

The changes in the economy described so far have two lasting effects at a macroeconomic level:

- Lower NFL reduce interest payments overseas and increase domestic incomes; and,
- Lower costs of capital increase the capital stock and allow for greater production levels.

The increased incomes generated are clearly reflected in Figure 11, which shows the path of GNDI and GDP over time. GDP experiences slower growth than GNDI for two reasons. First, the rise in consumption spending is offset by the decrease in net exports through the course of the simulation, as discussed above. Second, the decline in foreign interest payments is reflected in the GNDI and consumption figures but not the GDP figures. Rather, the growth in GDP represents the increased stock of capital available.

Figure 11 GDP, income and consumption – scenario 1
Percentage change from business-as-usual



Source: NZIER

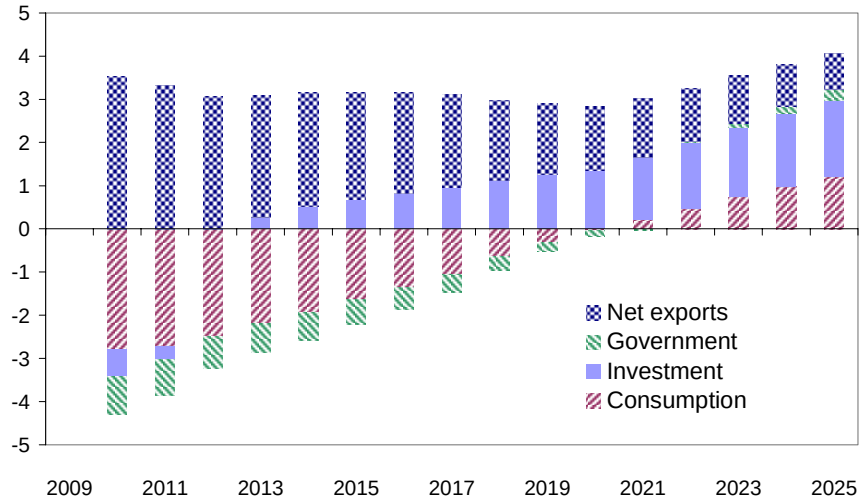
Decomposing the result into its component parts shows that consumption initially drops as consumers begin to save more and that is reflected in lower GDP due to the decrease in consumer demand (see Figure 12).

The subsequent increase in GDP is induced primarily by the increased capital stock while the reduction in interest repayments primarily accounts for the growth in GNDI and consumption, although some of the upward trend in GNDI is attributable to the income generated from increased capital. Notably, the increase in GNDI is so strong that consumption rises above BAU despite the lower propensity to consume.

Also visible in Figure 12 is the boom in net exports that persists over the medium run but is of decreasing importance to the overall change in GDP.

Figure 12 Contributions to GDP growth – scenario 1

Percentage change from business-as-usual in GDP as a consequence of change in named variable



Source: NZIER

3.2 Scenario 2: matching Australia's foreign liabilities

In this scenario we set an ambitious target for New Zealand's decrease in NFL: the APC is diminished far enough to push NFL down to 60% of GDP by 2020. As a consequence, this scenario also includes a significant effect from the falling cost of capital.

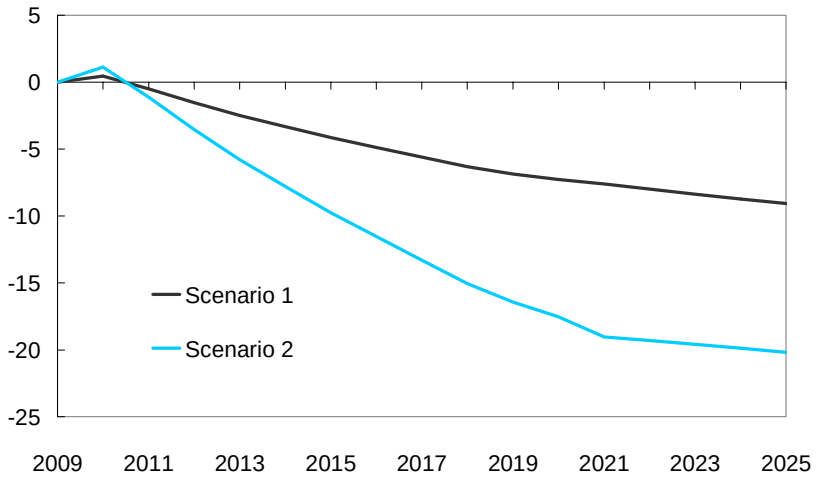
3.2.1 Direct impact

The APC drops by 8 percentage points from 86% to 78% of GNDI between 2011 and 2020 in order to reduce New Zealand's NFL to 60% of GDP. Thenceforth APC rises back up to 82% of GNDI to maintain the ratio of NFL to GDP. Figure 2 shows the precise change in NFL in this scenario.

The key differences between this scenario and the first are:

- The change in APC is far larger;
- APC does not remain constant throughout the simulation but partly reverses its decline once the target level of NFL is met; and,
- The cost of capital drops by 22% rather than 10%.

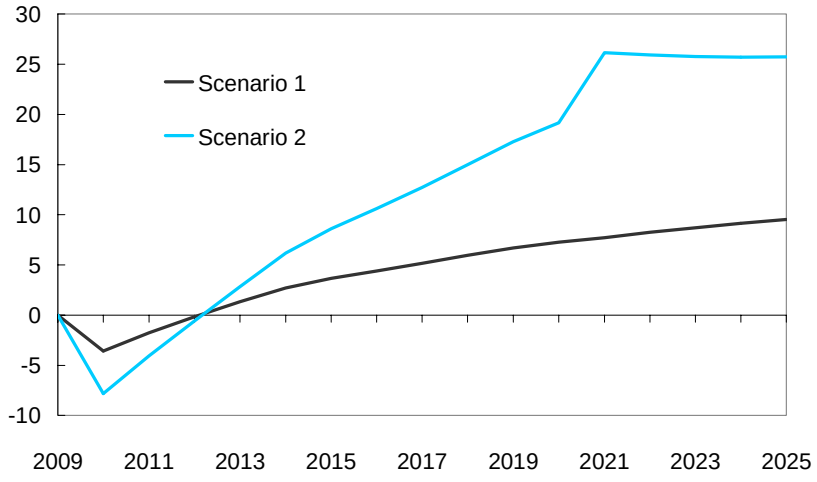
Figure 13 Cost of capital – scenario 1 vs scenario 2
Percentage change from BAU



Source: NZIER

The greater impact on the cost of capital (see Figure 13) means that investment rises greatly throughout the course of the simulation relative to scenario 1. However, as Figure 14 shows, the rise in the APC in 2021 after the NFL target is reached has a noticeable impact on the construction of new capital stock. First, it increases domestic aggregate demand which causes a one-off spike in the stock of capital as local service industries lift production. Secondly, it arrests the decline in the cost of capital (Figure 13), which causes the capital stock to stabilise from 2021 onward.

Figure 14 Capital stock – scenario 1 vs scenario 2
Percentage change from BAU



Source: NZIER

3.2.2 Increased effects on trade

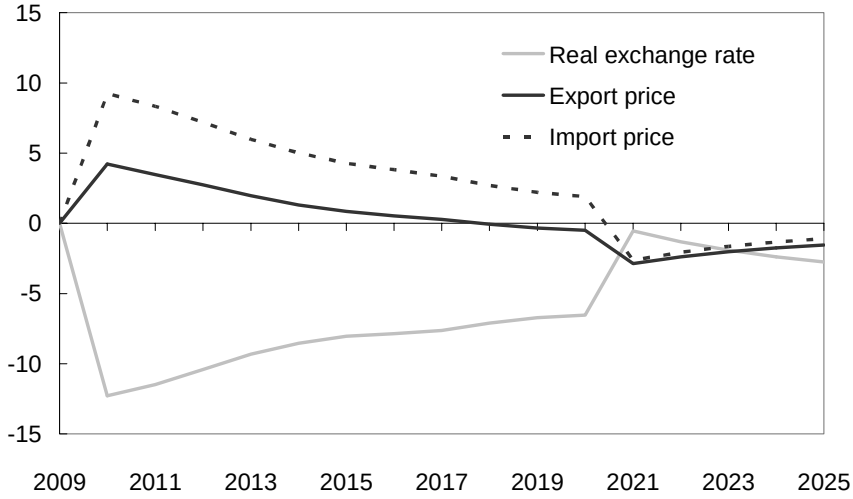
The change in currency flows is similar to scenario 1 but greater in magnitude: relative to BAU New Zealand reduces borrowing and pays down debt. Consequently

the nation is saving enough relative to BAU that the actual dollar value of our NFL decreases.

As Figure 15 shows, the impact on trade prices, up to 2020, is very similar to that of scenario 1, although the effects are larger. Relative to BAU we have started saving, which reduces the flow of currency out of the country and causes our currency to depreciate. That increases exports, reduces imports and causes a drop in the terms of trade.

Figure 15 Trade prices and the exchange rate – scenario 2

Percentage change from business-as-usual



Source: NZIER

A key difference in this scenario is the increase in the APC in 2021. Once the level of NFL has decreased to the target of 60% of GDP we increase the APC to hold the ratio constant. That adjustment in 2021 causes the outward flow of money to cease and the currency to appreciate significantly, as can be seen in Figure 15. As a consequence of the appreciation, the boom enjoyed by exporters is reversed while consumers benefit from cheaper imported goods.

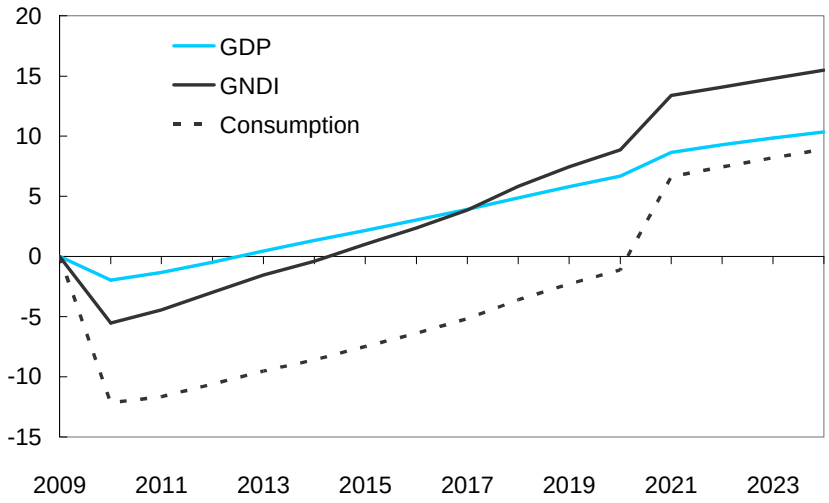
3.2.3 Income and GDP gains

The macroeconomic and industry effects of the increased savings follow logically from the trade results. In the main these results are the same as those for scenario 1, albeit with a greater magnitude.

As NFL diminish relative to BAU the burden of interest repayments decreases by $1.5 billion per annum by 2025. That increases incomes and thus household consumption, which is reflected in Figure 16 by increasing GNDI and consumption spending. Consumption is not positive until 2021 because the lower propensity to consume is offsetting the increased incomes. However, once the APC increases up

to 82% of GNDI consumption spending spikes rapidly. GDP is less affected by the increased incomes, as can be seen from its flatter trajectory.

Figure 16 GDP, income and consumption – scenario 2
Percentage change from business-as-usual



Source: NZIER

3.3 Scenario 3: A smaller impact on the cost of capital

The third scenario is a variation of the second: it takes the ambitious increase in the saving rate and asks what might happen if the estimated decrease in the cost of capital were not to eventuate at all, or to a lesser extent. To test that we both halve and remove the effect on the cost of capital in two separate simulations. Both sets of results are reported here.

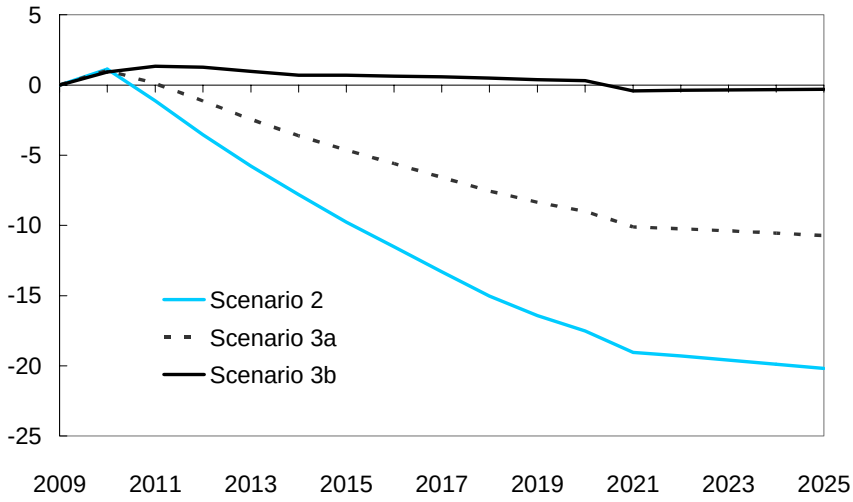
3.3.1 Changed assumptions

The only difference between scenario 2 and these simulations is the assumed change in the cost of capital. In each simulation the NFL decrease to 60% of GDP across the decade from 2010 to 2020 but in scenario 3a we decrease the cost of capital by only 5% and in scenario 3b we do not exogenously change it at all.[14] These differing assumptions are summarised in Figure 17.

Scenario 3b essentially isolates the effect of the savings change, while scenario 3a gives some idea of the sensitivity of our results to changes in the magnitude of the cost of capital shock.

[14] That is, we allow it to move as the economy adjusts to the savings shock. Interestingly, scenario 3b nonetheless exhibits an endogenous rise in the cost of capital between 2010 and 2020. That is because of the increase in exports associated with the expected exchange rate movements: the export intensive industries demand more capital as they grow, which pushes up the cost of capital slightly.

Figure 17 Cost of capital across scenarios
Percentage change from business-as-usual



Source: NZIER

3.3.2 Variation in macroeconomic impacts

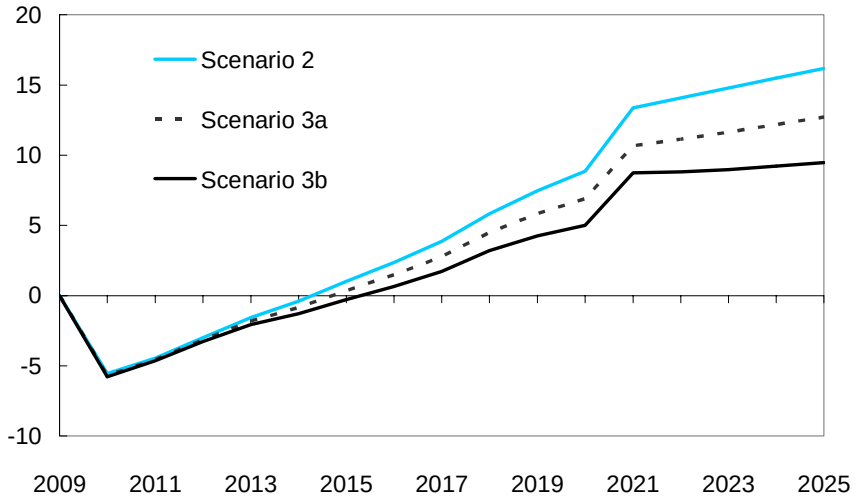
As Figure 18 shows, gross national disposable income rises whatever the cost of capital. Despite scenario 2 incorporating a 22% reduction in the cost of capital, scenario 3a an 11% reduction and scenario 3b no significant change, they all generate a significant rise in GNDI.

That consistent rise in disposable incomes is due to the repayment of foreign debt. All three scenarios represented in the chart have the same rate of saving and a similar rate of foreign debt payment so the reduction in interest repayments varies little across them.[15] The majority of the advantage of scenario 2 over scenarios 3a and 3b is the increased incomes from a greater capital stock, stimulated by the assumed lower cost of capital.

[15] The increase in investment generated by the lower cost of capital does have a small impact on the change in NFL but it is of relatively minor importance in explaining the difference in outcomes between the three scenarios.

Figure 18 GNDI comparison across scenarios

Percentage change from business-as-usual

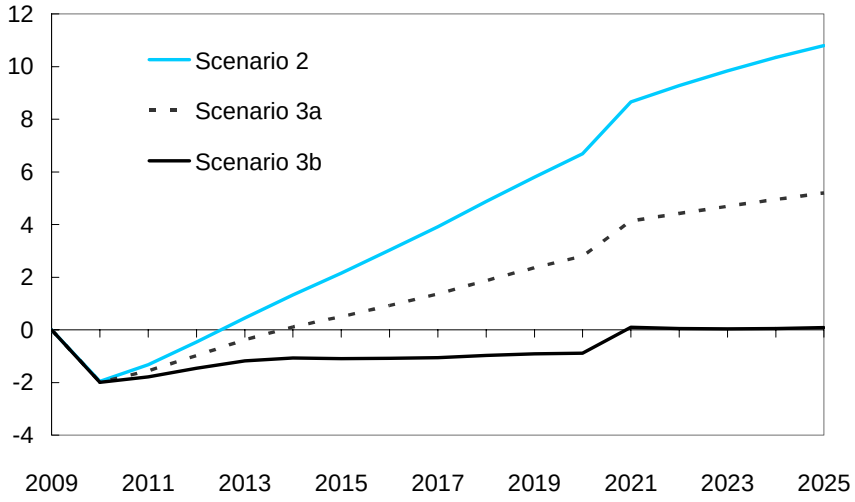


Source: NZIER

The rise in the stock of capital is most evident when looking at the variation in GDP (Figure 19). The decreased cost of capital in scenario 2 allows New Zealand to accumulate a far higher stock of capital and expand its productive capacity.

Figure 19 GDP comparison across scenarios

Percentage change from business-as-usual



Source: NZIER

4. Comparison of results

The results of our simulations are the product of a complex series of interactions, which are hard to check individually; however, simple macroeconomic accounting can be used to check that the numbers are plausible. Just such a piece of work has been provided to us by the Savings Working Group and here we compare our results from scenario 1 with that approach.

The work calculates the change required in savings in order to stabilise the ratio of NFL to GDP at 90%. It does that by calculating the difference between the cost of financing (*r*) and nominal GDP growth (*g*), then multiplying it by the current ratio of NFL to GDP. That provides a range of estimates of the required change in the saving to GDP ratio (see Table 2) for different values of *r-g.*

Table 2 Macroeconomic accounting estimates of required change in national savings

Difference between cost of financing and nominal GDP growth	Required change in saving as a percentage of GDP
1%	0.9%
2%	1.8%
2.5% (preferred)	2.2%
3%	2.7%
4%	3.6%

Source: Savings Working Group

The assumed cost of financing is 7.5% in the preferred estimate, with a nominal GDP growth rate of 5%. That requires lifting the rate of saving to GDP by 2.2 percentage points to stabilise NFL at 90% of GDP.

Our scenario 1 has the same target but requires a 2.7 percentage point increase in the rate of saving to GDP in 2010, rising to 3.1 percentage points by 2025.[16] However, our assumed cost of financing and growth rate are also different: we assume an interest rate of 7% on foreign debt and a long-run nominal GDP growth rate of slightly less than 4%, which gives an *r-g* difference of slightly over 3 percentage points. Looking at the corresponding line of Table 2 shows that our results are a very close match to the macroeconomic estimates.[17] It may be that adjusting the settings in our model's parameters to match the preferred assumptions in that piece of work would bring us even closer to those estimates.

[16] Note that we have previously talked of the rate of saving to GNDI rather than GDP. Here we use the latter in order to allow comparison with the Savings Working Group's figures.

[17] The nominal GDP growth in our base simulation fluctuates according to NZIER's Quarterly Predictions through to 2020 before asymptotically approaching 4%. We use the long run value here to allow easy comparison with Savings Working Group's static calculations.

The concordance of the two models' results is reassuring since it tells us that the modelling method and parameters used are probably sensible. That corroboration of the key parameter shift gives us greater faith in the dynamic story about the rest of the economy that the CGE model is telling.

5. Conclusions

NZIER's modelling exercise has demonstrated that an increase in national savings and a drop in the cost of capital would generate the following impacts on the New Zealand economy:

- The decrease in overseas debt would reduce the interest payments that New Zealand makes offshore.
- Decreased costs of capital stimulate investment and this increases investment and the capital stock and allows GDP to rise.
- Gross National Disposable Income would increase over the same period and allow a greater level of national consumption.
- Real wages would grow due to higher labour productivity that, in turn, reflects greater capital intensity.
- In the medium run the economy would become more export-driven due to a depreciation of the New Zealand dollar following reduced offshore payments. However, in the long-run the re-balancing towards tradeables does not persist.

We also show that there are short-term costs associated with boosting national savings. The initial depreciation of the New Zealand dollar pushes up the costs of imports. This, combined with initially lower levels of household spending, depresses incomes and GDP below the business-as-usual baseline for some years.

The extent to which financial markets reduce New Zealand's interest rates following any improvement in national savings is a critical driver of the production impacts of such a shift. However, the impact on incomes is still positive in the long-run, even if there is very little change in the nation's cost of capital.

Finally, these results show the considerable influence that the baseline forecasts have on such simulation results. We caution that the magnitude of these results depends heavily on uncertain projections of what NFL might be in 15 years. More important than the magnitude of the results is the picture they paint of the changes that can be expected in the economy if New Zealand were to increase its rate of national saving.

Appendix A CGE modelling framework

A.1 MONASH-NZ

Our results were produced on a model of the New Zealand economy based on a tried and tested generic model (MONASH) that has been found effective for policy analysis in Australia and around the world. The model has been calibrated to the local setting and loaded with New Zealand data. The assumptions needed are based on consultation with industry specialists and reflect best practice.

The model has been developed with considerable assistance from CGE modelling experts at the Centre of Policy Studies at Monash University in Melbourne Australia. For a more detailed exposition of the model please refer to their work.[18]

A.2 Database structure

The model is based on a large database containing the value flows of the economy, as per Figure 20. The database defines the initial structure of the economy, which by definition is assumed to be in equilibrium in all markets. The structure of the database is broadly similar to traditional input-output tables; for example commodities may be used as intermediate input for further production, utilised in investment, exported or consumed by households and the government. Industry costs include the cost of intermediates, margins, taxes and primary factor costs for labour, land and capital. As per the accounting identities in input-output tables, the total value sum of producers' input costs (including margins, taxes, returns to factors and other costs) equates to the total value of output production (the 'MAKE' matrix in the database).

The MONASH-NZ model consists of:

- 131 industries
- 210 commodities
- 1 household

The database has been sourced initially from Statistics New Zealand 1995/96 Inter-Industry tables, updated using the subsequently released 2003 Supply and Use tables, and finally 'up-scaled' to 2010 levels using latest Statistics New Zealand macroeconomic data.

[18] Mark Horridge, Monash University. Centre of Policy Studies, and IMPACT Project (Australia), *ORANI-G: A General Equilibrium Model of the Australian Economy* (Centre of Policy Studies, 2000); Peter B Dixon, Brian R Parmenter, and Maureen T Rimmer, "MONASH: A Dynamic, Computable General Equilibrium Model of the Australian Economy," *Amsterdam: Elsevier* (2002).

Figure 20 The MONASH-NZ database

		Absorption Matrix					
		1	2	3	4	5	6
		Producers	Investors	Household	Export	Government	Change in Inventories
	Size	← I →	← I →	← 1 →	← 1 →	← 1 →	← 1 →
Basic Flows	↑ C×S ↓	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS
Margins	↑ C×S×M ↓	V1MAR	V2MAR	V3MAR	V4MAR	V5MAR	n/a
Taxes	↑ C×S ↓	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	n/a
Labour	↑ O ↓	V1LAB					
Capital	↑ 1 ↓	V1CAP					
Land	↑ 1 ↓	V1LND					
Production Tax	↑ 1 ↓	V1PTX					
Other Costs	↑ 1 ↓	V1OCT					

C = 210 Commodities

I = 131 Industries

S = 2: Domestic, Imported

O = 24 Occupation Types

M = 5 Commodities used as Margins

	Joint Production Matrix
Size	← I →
↑ C ↓	MAKE

	Import Duty
Size	← 1 →
↑ C ↓	V0TAR

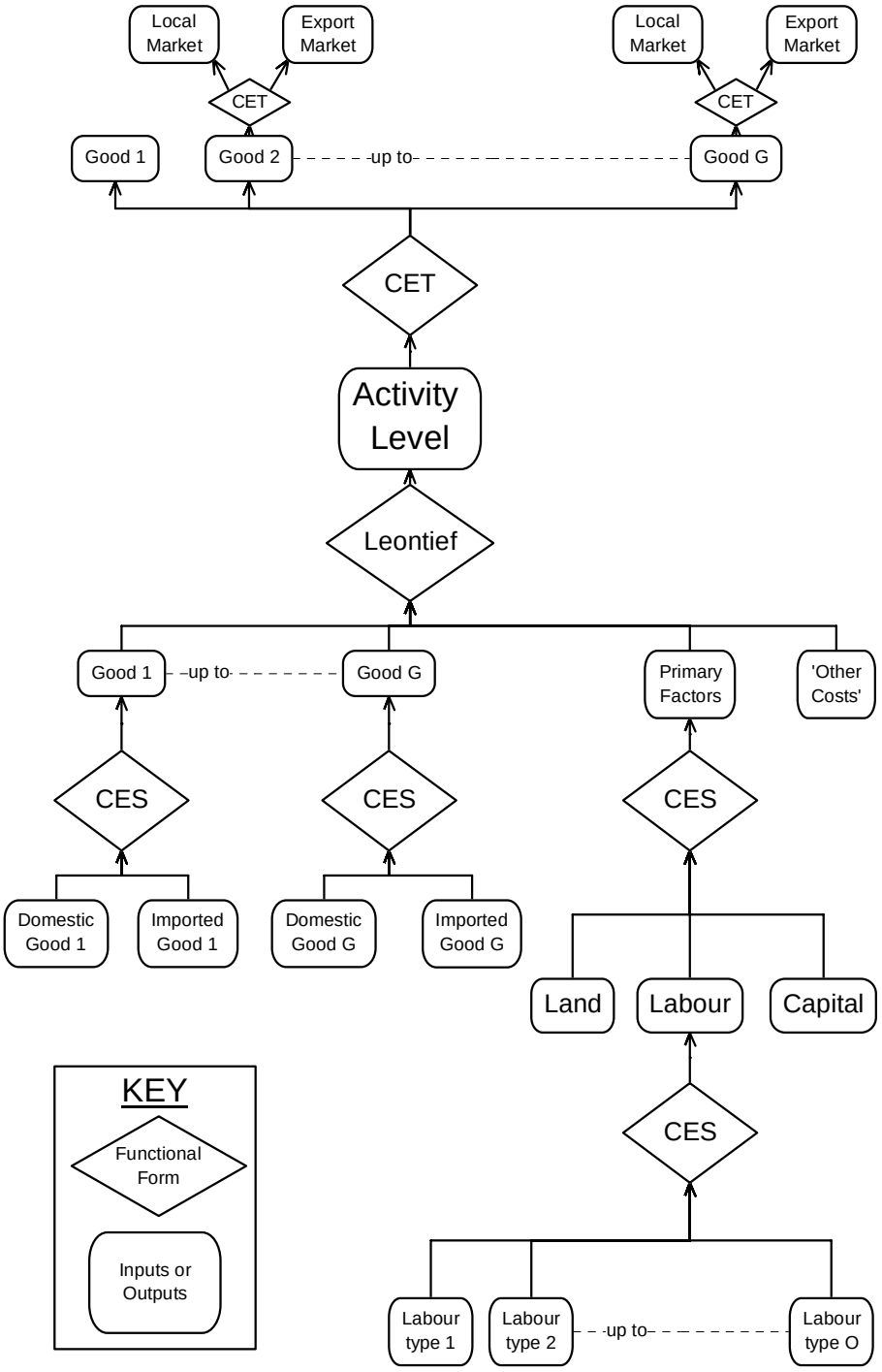
Source: Horridge, 2000; NZIER

A.3 Production structure

The production structure of the model is presented in Figure 21. Each industry can produce a number of different commodities. Production inputs are intermediate commodities, both domestic and imported, and primary factors labour, land and capital. Working from bottom to top, we see constant elasticity of substitution (CES) production nests for occupations, primary factors and the choice between imported and domestic commodities. In this case, an increase in price moves sourcing

towards another input, for example, if the price of imports increases, more domestic commodities are demanded in the intermediate sourcing CES nest.

Figure 21 Production structure



Source: Horridge, 2000

At the activity level, intermediate goods, primary factors and other costs are combined using a Leontief production function. This means the proportion of production inputs does not change. On the output side, there are two further constant elasticity of transformation (CET)[19] nests. The production mix of each industry is dependent on the relative prices of each commodity. Similarly, the export nest determines local and export market shares depending on relative prices.

A.4 Database modification

For this project we modified our database to provide a more manageable number of industry results. The database was aggregated to 13 industries producing 16 commodities, which can be easily split into tradeable and non-tradeable sectors.

A.5 Cost of capital assumptions

Section 2.2.2 discusses the assumptions we make when reducing the cost of capital in our policy simulations but does not explicitly define the assumptions in the baseline forecast simulation. Here we clarify that for technically minded readers.

The base projections are set according to NZIER's *Quarterly Predictions*; we exogenise key macroeconomic variables and endogenise structural parameters such as technology and the APC. To then run a policy simulation in which the APC varies we reverse the closure to set macroeconomic variables endogenously and the structural parameters exogenously. It is then possible to exogenously vary the structural parameters, such as the APC and the technology parameter for investment.

This method assumes that the macroeconomic forecasters have taken in to account the likely changes in the cost of capital when they determined the future path of investment spending. Thus, in the base projections we do not exogenously vary the cost of capital but allow it to endogenously adjust to the exogenous changes in the level of investment in the economy. However, in the policy simulation, the level of investment is endogenous and we exogenously change the cost of capital to simulate the expected adjustments.

A.6 The MONASH-NZ investment mechanism and capital accumulation

The MONASH-NZ CGE model incorporates a mechanism for intertemporal changes in capital stocks. The changes are driven by the expected rate of return on an industry's current capital stock and are funded through investment. That investment, in turn, is funded through domestic savings and overseas borrowing. Some further

[19] A CET function is identical to a CES function except that the transformation parameter has the opposite sign (i.e. increasing price increases output in a CET; in a CES, increasing price reduces demand)

detail on the mechanisms are included below but interested readers should consult Dixon and Rimmer for a more thorough treatment of the topic.[20]

A.6.1 Capital accumulation

The MONASH-NZ model has an endogenous capital accumulation mechanism. In each period the capital stock is equal to the previous period's capital stock minus depreciation, plus the additional investment in the previous year.

Investment is directed to industries according to their return on capital. Specifically, each industry has an assumed equilibrium rate of return on capital that is calculated from historical data and exogenously imposed. In each year of a simulation the model then calculates the actual rate of return on capital in that year as the difference between the rental rate of capital and the cost of capital. That rental rate is based on the calculated price of goods and services provided by the industry. The difference between the actual and equilibrium rate of return in that industry determines whether the industry has positive net investment.

Thus, investment in each year of the simulation is driven by the endogenously calculated deviation in each industry's return on capital from equilibrium. If an industry experiences a growth in demand and output prices rise then the return on capital will increase. There will be a resulting increase in investment in that industry until the capital stock has grown such that the return on capital decreases back to its equilibrium level.

The rate of change of the capital stock is also capped at an industry level. A logistic function is used to transform the deviation in actual rates of return from equilibrium into a change in the capital stock. The asymptotes of that logistic curve are set 6% either side of the historical growth rate of the industry's capital to prevent unrealistically large changes in capital from year to year. However large the change in the rate of return, the change in capital stock can be only the historical growth rate, plus or minus 6%.

A.6.2 Investment

New capital stock is created by investment and the cost of a unit of capital depends upon the current demand for investment, which is driven by the required change in the capital stock. The supply of investment funds comes from domestic savings and overseas borrowing. Domestic savings are assumed to be a constant percentage of GNDI and overseas borrowing occurs at an exogenously determined interest rate of 7%. If there is a shortage of domestic savings relative to required investment then overseas borrowing is assumed to make up the difference and NFL increase. Conversely, if domestic savings are greater than the required level of investment then our NFL decline.

[20] Peter B Dixon and Maureen T Rimmer, *Dynamic general equilibrium modelling for forecasting and policy: a practical guide and documentation of MONASH* (Elsevier, 2002), 189.

A.6.3 Particular shocks implemented in this report

For the modelling exercise in this report the exogenous rate of saving to GNDI is changed to reflect a change in the saving rate. That increases the supply of funds to the domestic investment market but does not affect equilibrium in the market for investment; rather it decreases the reliance on foreign borrowing to fund it.

The second shock proxies a decrease in the cost of capital by shifting out the investment supply curve. That means a unit of capital can be obtained at a lower price, which proxies a reduction in the nation's risk premium. In addition, the decreased price of capital increases the rate of return on capital and moves the market down the investment demand curve. In sum, the initial shock causes a dramatic increase in the level of investment and a slight drop in the cost of capital. That then increases the capital stock in the next period, thus decreasing the rate of return on capital and reducing investment in the next period. The cycle continues until the capital stock has risen such that the rate of return on it declines to the historical equilibrium level.

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