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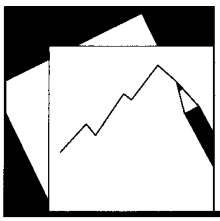

IMF Working Paper

Potential Growth of Australia and New Zealand in the Aftermath of the Global Crisis

Yan Sun

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Asia and Pacific Department

Potential Growth of Australia and New Zealand in the Aftermath of the Global Crisis

Prepared by Yan Sun[1]

Authorized for distribution by Ray Brooks

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Abstract

Using a production function method, this paper assesses the impact of the global crisis on the potential growth of Australia and New Zealand. The two countries have not been hit hard by the global crisis, but have large net external liabilities. The paper finds that the main negative impact of the global crisis is likely to come through higher costs of capital, offset partly by a higher return to capital from strong demand for commodities by emerging Asia. It estimates medium-term potential growth of about 3 percent for Australia and 2⅓ percent for New Zealand, higher than that of many other advanced economies.

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Author's E-Mail Address: YSun2@imf.org

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I. Introduction

This paper assesses the impact of the global financial crisis on potential growth of Australia and New Zealand over the medium term. It uses a simple production function framework to analyze key factors underlying potential growth in the last 25 years and explore possible developments in the next few years. The global crisis has not hit Australia and New Zealand as hard as many other advanced economies, although New Zealand's economic performance has been less remarkable than Australia's. Nevertheless, as Australia and New Zealand have long been "capital importing" countries, the global crisis could affect their potential growth through the cost and availability of capital and the productivity of capital.

This paper finds that the main negative impact of the global crisis is likely to come through higher costs of capital, offset partly by a higher return to capital from strong demand for commodities. Tighter financial conditions and higher cost of capital in the aftermath of the crisis may weigh on future investment and capital accumulation for Australia and New Zealand. At the same time, strong demand for commodities from emerging Asia, especially for Australia, could increase the return to capital and thereby support investment and capital accumulation. Given the limited increase in unemployment seen in both countries, labor participation and productivity are unlikely to be hurt significantly as a result of the crisis. However, demographic trends imply that growth in the working age population is set to slow modestly over time. On balance, this paper estimates potential growth of about 3 percent for Australia and 2⅓ percent for New Zealand over the medium term, higher than that of many other advanced economies, reflecting partly their strong linkages to fast-growing Asia.

II. Impact of the Crisis on Capital, Labor, and Productivity

The recent global financial crisis has sparked renewed interest in analyzing potential output. Given the "unobservable" nature of potential output, large uncertainties surround the estimate of output gap, the extent and sources of output losses, and future potential growth in the aftermath of a financial crisis. Nevertheless, having a clear understanding on these issues is essential for determining the timing and pace of exiting from the extraordinary policy support implemented in many economies. For example, an under-estimation of potential output loss in the face of large output falls may delay monetary tightening, fueling inflationary pressure. On the fiscal front, an optimistic medium- to long-term potential growth expectation may result in insufficient fiscal consolidation, jeopardizing debt sustainability.

In theory, the financial crisis could affect the level and growth of potential output through a number of channels.

- **Capital**. Tighter financial conditions and higher risk premia could depress investment and capital accumulation, reducing potential growth during the transition period toward a lower equilibrium capital-output ratio. A higher capital cost would also

cause the equilibrium capital-output ratio to fall, implying a permanently lower potential output.

- **Labor**. The overall impact is not clear cut. A protracted and deep recession could reduce the potential labor force by discouraging labor participation and migration flows (European Commission, 2009). Possible hysteresis effects could also lead to an increase in the NAIRU (Blanchard and Summers, 1989). At the same time, economic hardship during a recession could encourage existing employees to work longer or secondary earners to join the workforce, or immigrate to countries with stronger job prospects. These positive impacts on labor input, however, may be temporary.

- **TFP**. The overall impact is uncertain. Tighter credit supply and rising uncertainties could discourage firms from innovating and investing in R&D, and protracted unemployment could impair human capital. But removing obsolete capital and restructuring may improve efficiency and productivity.

Recent research suggests that financial crises could lead to lower potential growth in the near- to medium-term and large permanent output losses. Cerra and Saxena (2008) estimate a permanent output loss of 4–16 percent following financial crises in developed and less developed countries. European Commission (2009) finds that the recent global crisis will result in a drop of euro area potential growth by ¾ percent in the near-term and a permanent potential output loss of 5 percent. The IMF (2009) also finds that medium-term output losses following banking crises are substantial—close to 10 percent on average seven years after the crisis. Furceri and Mourougane (2009) find that past financial crises have, on average, lowered the level of potential GDP permanently by 1½–2½ percent, with some countries having potential output declining by as much as 4 percent.

A. Investment and Capital

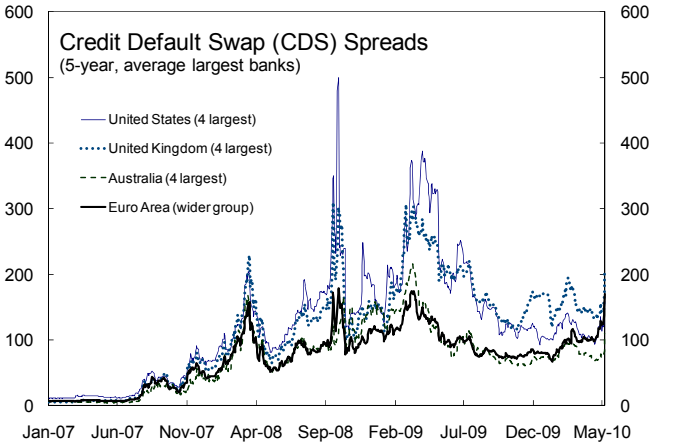
Cost of Capital

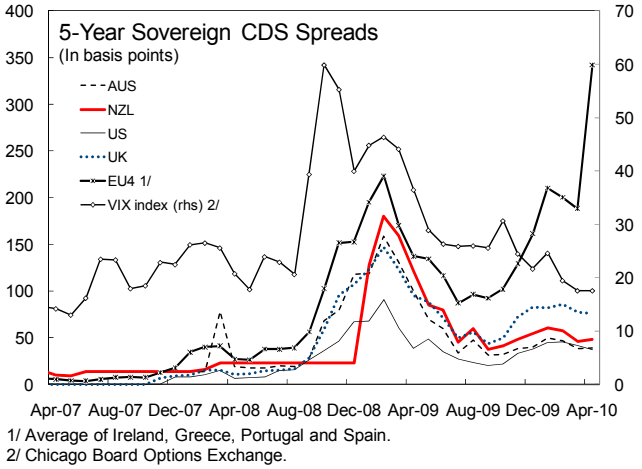
A higher cost of capital may become a long-lasting legacy of the recent global crisis, weighing on future investment. On the supply side, tighter financial regulation and supervision—warranted for stability considerations—may well imply that financial intermediation will not return to the same high level as during the pre-crisis era. At the same time, rising public debt of major advanced economies will significantly raise the demand for credit. The crisis has also led to a general increase in risk awareness among investors, raising borrowing risk premia for many countries, including Australia and New Zealand.

- By early May 2010, Australian bank CDS spreads and sovereign CDS spreads of Australia and New Zealand remained higher than pre-crisis levels (see text charts below). However, the increase in Australian bank CDS spreads to about 100 bps was smaller than that for large banks in the U.S., U.K., and Euro area. The widening of

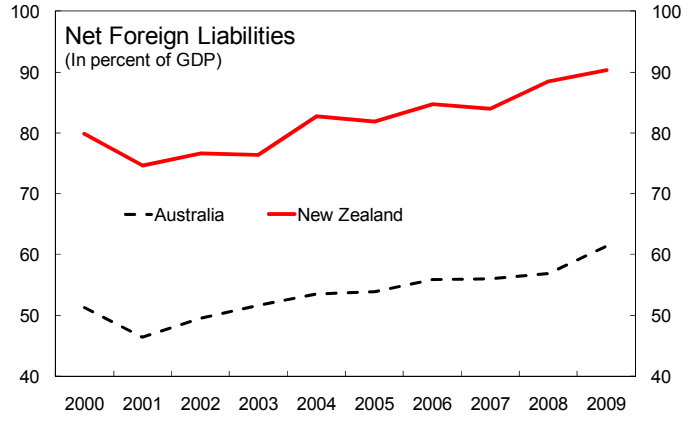
sovereign CDS spreads was muted for Australian and New Zealand, with no sign of contagion from the increasing spreads for some peripheral European countries.

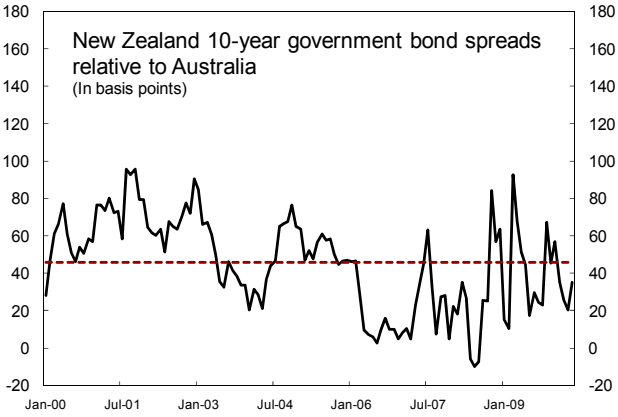
- New Zealand sovereign CDS spreads have remained slightly higher than Australia's since 2009. New Zealand's long-term government bond yields have also risen more than Australia's relative to 2006–07, despite Australia's higher policy rate. Higher external debt of New Zealand may be a factor behind its higher risk premium.





1/ Average of Ireland, Greece, Portugal and Spain.
2/ Chicago Board Options Exchange.





Sources: ABS; Statistics New Zealand; and author's calculation.

Source: Haver.

There is scope for central banks in Australia and New Zealand to adjust monetary policy to offset the changes in risk premia, although there are limits to this approach. This was evident during the global financial crisis. Despite the jump in spreads, borrowing costs fell as a result of significant and effective monetary easing, supported by a sound banking sector that weathered the global crisis well.

A simulation of the IMF's GIMF model calibrated for New Zealand suggests that an increase of real domestic interest rates by 3 percentage points would lead to a permanent fall in the capital/output ratio of 12 percentage points (Box 1). The large jump in the cost of capital should be seen as a tail risk. The impact on the economy of such a large increase is significant, as it results in an almost 40 percent fall in investment after five

years and 4½ percent drop in output relative to baseline over the medium term. The table below illustrates the impact of smaller falls in investment, by say 1, 5, or 10 percent that may result from smaller rises in the cost of capital or a lesser impact of the rise in cost of capital on investment. While the impact on potential output is smaller than in the GIMF simulation, the impact is still sizable.

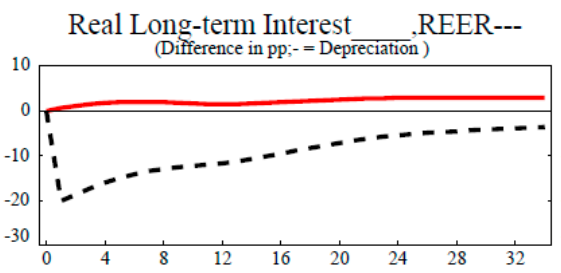
New Zealand: Higher Cost of Capital and Lower Potential Growth
(In percent)

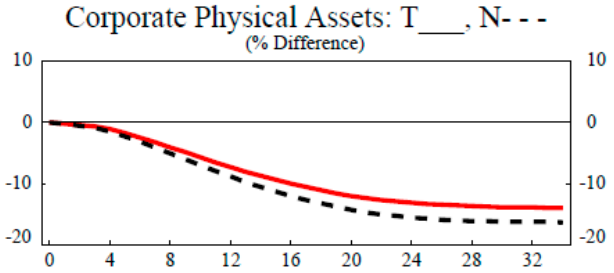
Reduction of investment	Average decline in potential growth during 2010-15	Potential output loss by 2015
1 percent	0.02	0.08
5 percent	0.12	0.54
10 percent	0.24	1.12

Source: author's calculation.

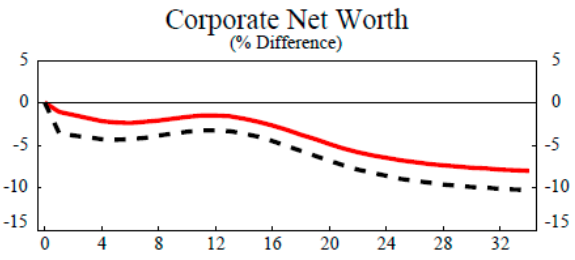
BOX 1. HIGHER COST OF CAPITAL

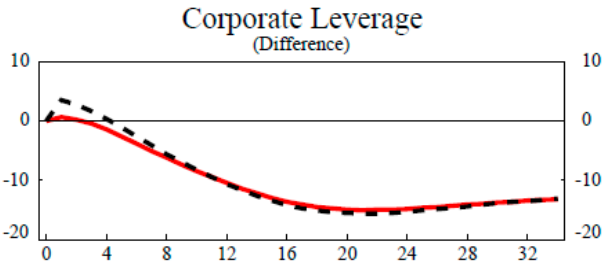
The Fund's Global Integrated Monetary Fiscal (GIMF) model, calibrated for New Zealand (see forthcoming IMF working paper by Werner Schule), has been used to estimate the impact of a permanent increase in the cost of capital in general equilibrium. The simulations assume a higher permanent sovereign risk premium that raises real interest rates by 3 percentage points and depreciates the NZ$ effective exchange rate (TWI) by 20 percent initially. The hike in real interest rates is much larger than observed recently and the experiment should be seen as stress test rather than forecast. The depreciation dies away as the economy adjusts.



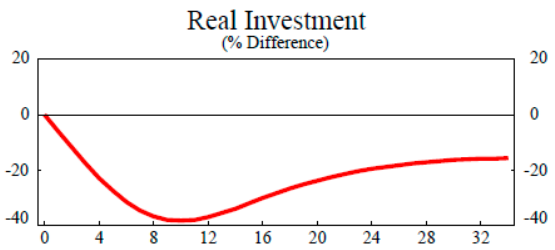


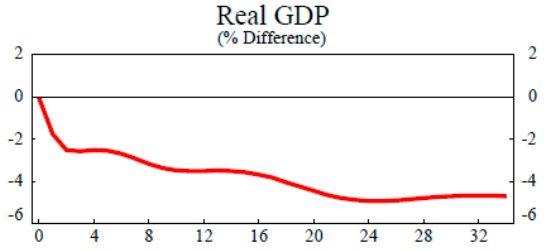
Higher capital costs and lower sales expectations depress investment. As a result the Capital/GDP ratio falls permanently by 12 percentage points. Corporate net worth falls, but firms reduce borrowing by more as interest rates have risen. As a result, the corporate leverage ratio declines.





With higher real interest rates, investment drops sharply below baseline and remains permanently lower. Real GDP drops about 4½ percent below baseline.

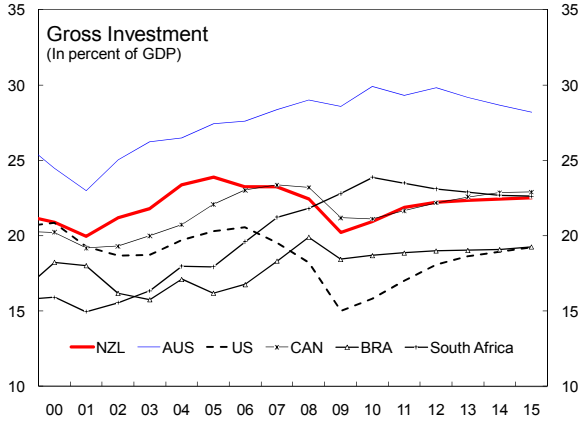




Investment Return

Demand for commodities from fast-growing emerging Asia, especially for Australia, is likely to raise the return on capital. Specifically,

- **Terms of trade gains**. Australia enjoyed a substantial gain in its terms of trade—close to 70 percent—during 2000–08. While New Zealand's terms of trade improvement was not as impressive as Australia's, it was still sizable at 25 percent during this period. Despite a small correction in the terms of trade during the global crisis, IMF staff project the terms of trade to remain elevated for both countries, especially for Australia, where nominal GDP growth would benefit tremendously. Moreover, the large terms of trade gain in Australia and the capital intensive nature of the resource sector are factors explaining high investment relative to other countries. In a neo-classical model, higher terms of trade could offset diminishing return to capital input, boosting investment. Capital could also move to places such as Australia where higher returns are expected, dampening the negative impact of the crisis on Australia's potential output.



- **Emerging Asia.** Australia's export destinations have shifted from slow-growing advanced economies to fast-growing emerging countries like China and India (see text charts and tables below). For New Zealand, the shift has not been as dramatic, but it has benefited indirectly from Australia being its largest trading partner, with close to a quarter of its exports going across the Tasman. Going forward, a further shift of exports to fast-growing emerging Asia would boost the two countries' investment and growth prospects. To illustrate this point, a rough projection of the direction of exports suggests that by 2015 about a third of Australia's exports would go to China, which is also expected to surpass the U.S. as New Zealand's second largest export destination, only after Australia.[2] This would raise Australia's trade-

[2] This is by assuming roughly historical growth rates for Australia and New Zealand. Australia's total merchandise exports grew by 8 percent per annum during 1989–2009. In particular, exports to China and India grew by 18–19 percent per annum while exports to the U.S. and Germany grew by just 3–4 percent annually. New Zealand's exports grew by 4 percent annually during the last decade, with exports to China and India growing at 17–18 percent per annum while exports to Japan and the U.S. shrinking modestly.

weighted partner country growth to almost 6 percent and New Zealand's to almost 5 percent, significantly above the growth rates implied by using current or historical weights.

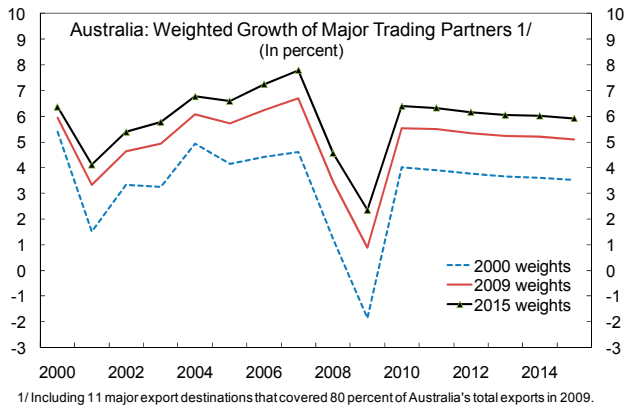
Australia and New Zealand: Increasing Ties with Emerging Asia

Australia: Major Mechandise Export Destinations
(In percent of total)

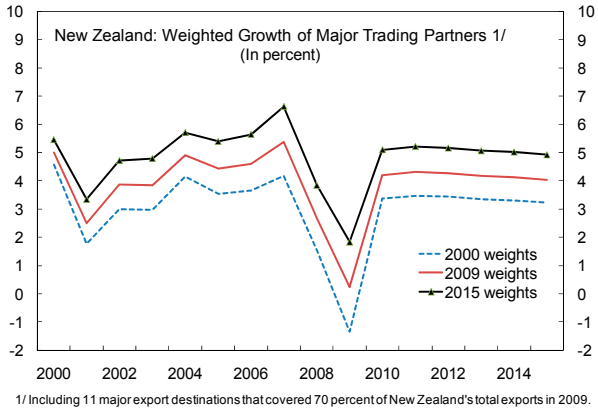
	2000 Act.	2009 Act.	2015 Proj.
China	5.4	21.6	33.1
Japan	19.8	19.5	17.4
Korea	8.2	7.9	8.9
India	1.7	7.4	11.3
United States of America	10.0	4.9	3.9
United Kingdom	3.4	4.6	4.1
New Zealand	6.0	4.0	3.8
Taiwan Province of China	5.0	3.3	3.3
Singapore	5.3	2.7	2.7
Hong Kong	3.2	1.5	1.1
Germany	1.2	0.8	0.6
Sum	69.1	78.2	90.2

New Zealand: Major Mechandise Export Destinations
(In percent of total)

	2000 Act.	2009 Act.	2015 Proj.
Australia	20.4	23.0	24.4
United States of America	14.5	10.0	6.3
China	3.2	9.1	16.4
Japan	13.5	7.1	3.7
United Kingdom	5.2	4.3	3.0
Korea	4.5	3.1	2.1
Singapore	1.7	2.8	3.3
Hong Kong	2.7	2.0	1.6
Germany	2.4	1.9	1.3
Taiwan Province of China	2.4	1.9	1.3
India	0.6	1.6	2.8
Sum	71.0	66.9	66.1



1/ Including 11 major export destinations that covered 80 percent of Australia's total exports in 2009.



1/ Including 11 major export destinations that covered 70 percent of New Zealand's total exports in 2009.

Sources: ABS; Statistics New Zealand; WEO; and author's calculation.

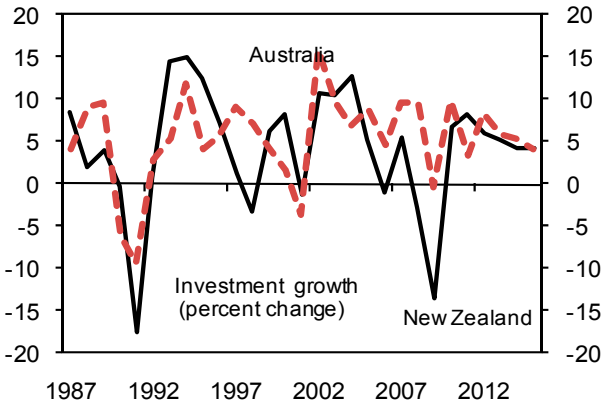
Investment Prospects

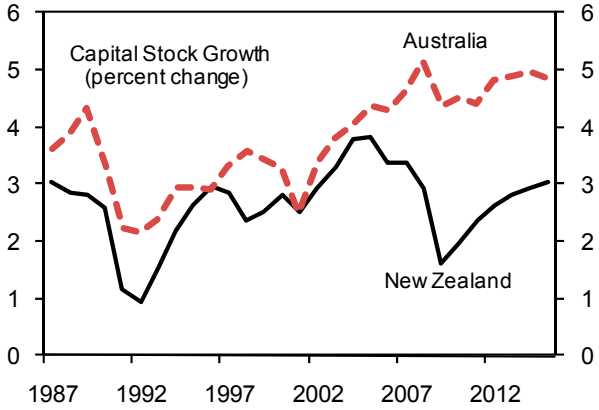
IMF staff forecasts take account of the higher cost of capital and closer integration with Asia and expect stronger capital accumulation for Australia than New Zealand.

- For New Zealand, investment fell sharply in 2009, but is projected to recover over the medium term. Growth in the capital stock would remain below pre-crisis levels (see text chart).

- For Australia, investment barely fell in 2009, and average investment growth is expected to be slightly stronger over the medium term. As a result, growth in the capital stock is expected to be almost twice the level of New Zealand.[3]

- The projected weaker capital growth for New Zealand reflects its much larger investment fall during the crisis and a slightly higher cost of capital and lower investment return going forward. New Zealand's larger net foreign liabilities (about 90 percent of GDP) imply a higher risk premium and borrowing cost than Australia, whose net foreign liabilities stood at 60 percent of GDP in 2009. Moreover, Australia enjoys closer ties with emerging Asia and stronger terms of trade gains, boosting its investment returns.



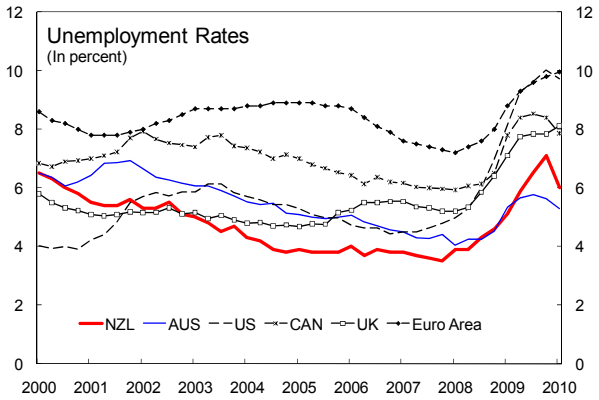


Sources: ABS; Statistics New Zealand, and author's calculation.

B. Labor

The limited increase in unemployment in Australia and New Zealand during the crisis suggests that trend labor supply is unlikely to be adversely affected by the crisis.

- **NAIRU.** Australia's unemployment rate peaked at below 6 percent while New Zealand's peaked at 7.1 percent. The limited increase in unemployment suggests that hysteresis effects are unlikely to play out. Australia's NAIRU is estimated to remain unchanged at 5 percent throughout the crisis (Figure 1). New Zealand's NAIRU



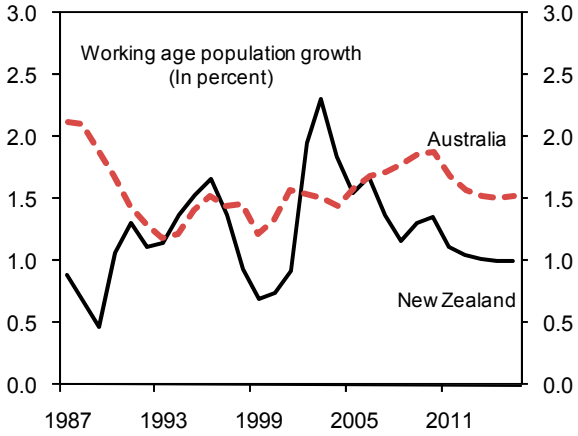
Sources: Statistics New Zealand; World Economic Outlook.

[3] The path of capital stock accumulation is obtained using a perpetual inventory method and estimated historical depreciation rates.

estimate increased only slightly during the crisis and is expected to return to 4½ percent by 2015.

- **Labor participation.** The relatively shallow recession is also unlikely to have discouraged labor participation significantly. The labor participation rate has broadly held up during the crisis and is expected to continue trending up, albeit at a slightly slower pace. Reflecting a flexible labor market, the trend decline in average working hours, which other advanced economies such as Canada and the U.S. also experienced, is expected to continue in the medium term.

- **Working age population.** Australia's population growth has been trending upwards in recent years. The jump in net migration in Australia and New Zealand in 2009 boosted the growth of working age population and may have in part reflected the relatively strong economic performance of these countries. However, this trend is not expected to continue for New Zealand, with a stronger recovery in Australian labor market likely attracting workers across the Tasman. Additionally, an aging society will reduce the growth of working age population over the medium term.



Sources: ABS; Statistics New Zealand; and author's calculation.

C. Productivity

One likely channel for the global crisis to reduce productivity growth in Australia and New Zealand is through higher cost of capital. Estevao and Severo (2010) show that increases in the cost of funds have a significant negative impact on TFP growth, through the channel of poor allocation of factors across firms reducing the productivity of entire industries. Although Australia and New Zealand did not experience a domestic financial crisis, their large external liabilities expose them to higher borrowing costs in the global market. The impairment of human capital, another important factor underpinning productivity, is minimal due to the limited increase in unemployment in both countries.

D. Projections for Potential Growth

Looking ahead, Australia's potential growth is projected at about 3 percent and New Zealand's 2⅓ percent in the medium term (Tables 1 and 2)**.** The projections should be seen as illustrative given the uncertainties about the impact of the crisis, especially the extent of change in the cost of capital and its impact on investment. Key elements

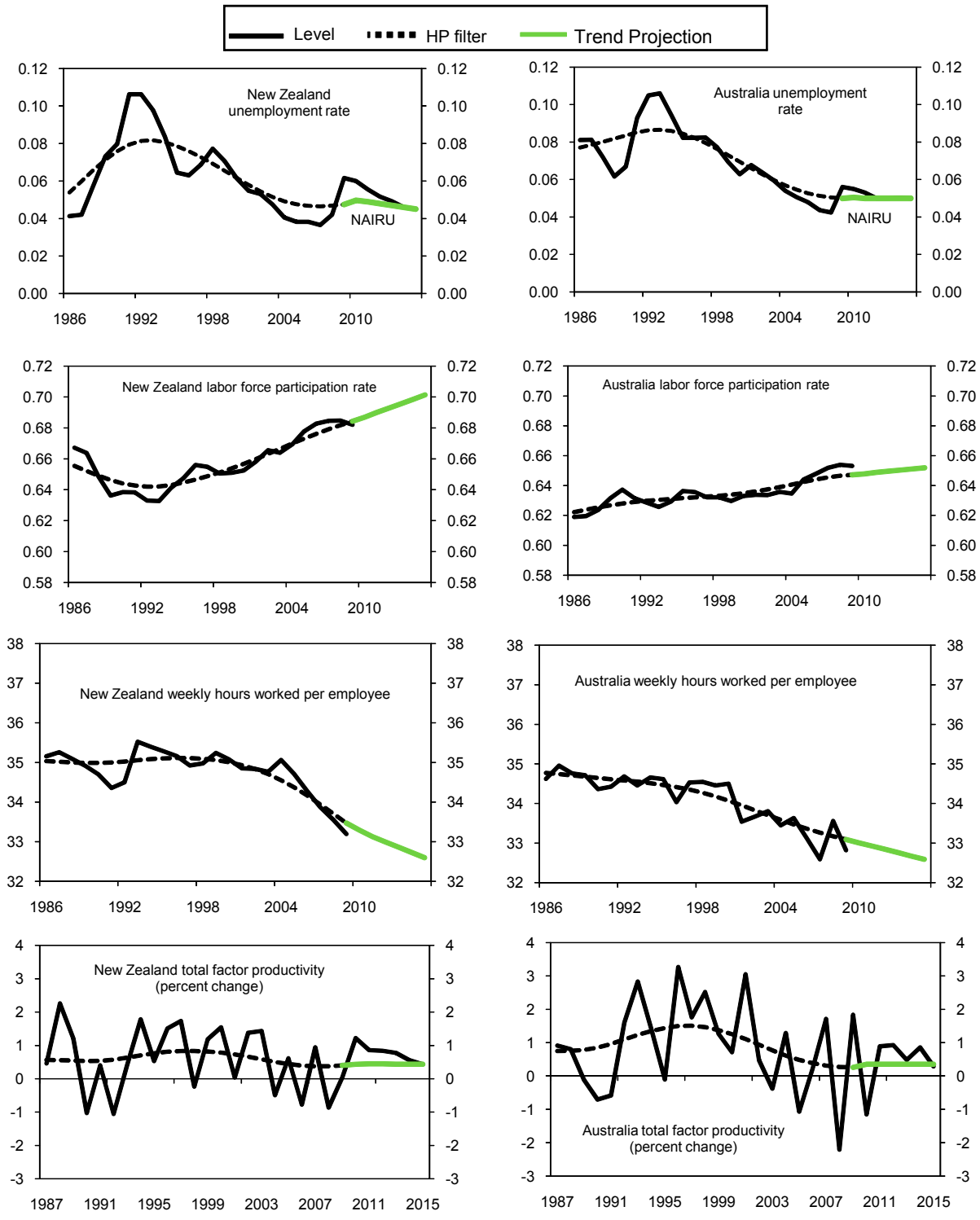
underpinning the potential growth projections for Australia and New Zealand are compared in Table 3. Given inherent difficulties in estimating productivity, trend TFP growth is assumed to remain broadly constant in the coming years. This assumption takes account of the result that trend TFP growth for both countries is found to have stabilized around 0.4 percent during the last five years (Figure 1).

Australia and New Zealand: Contribution to Potential Growth in 2015
(In percent)

	Australia	New Zealand
Potential Growth	3.1	2.3
Capital Services	1.9	1.2
Stock of capital	1.9	1.2
Capacity utilization	0.0	0.0
Labor Services	0.8	0.7
NAIRU	0.0	0.1
Labor force participation rate	0.1	0.2
Average hours worked	-0.2	-0.2
Working age population	0.9	0.6
Total Factor Productivity	0.4	0.4

Sources: author's calculation.

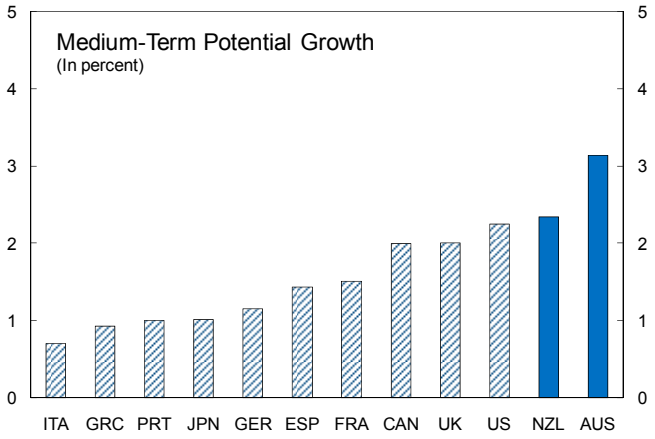
Figure 1. Australia and New Zealand: Labor and Productivity Growth

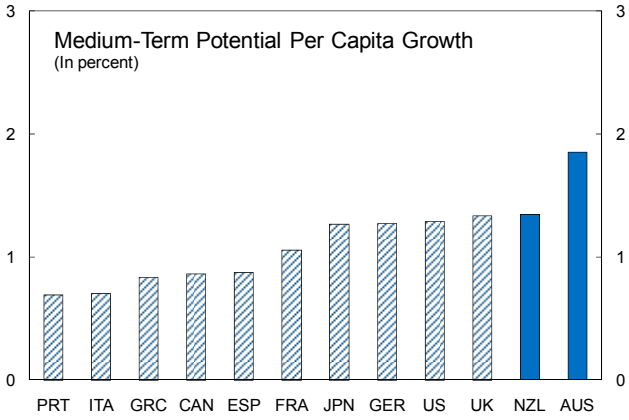


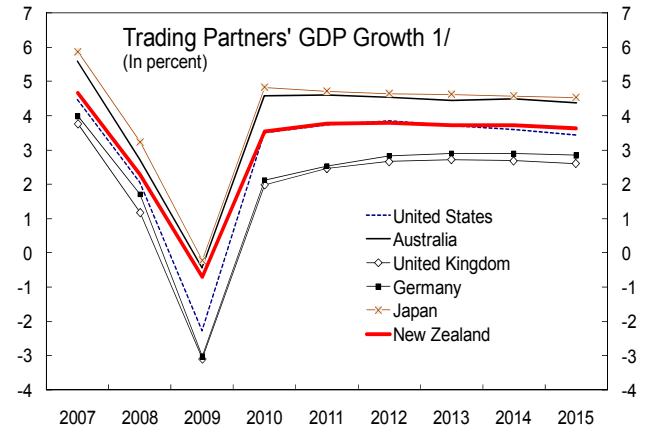
Sources: Statistics New Zealand; ABS; and author' calculations.

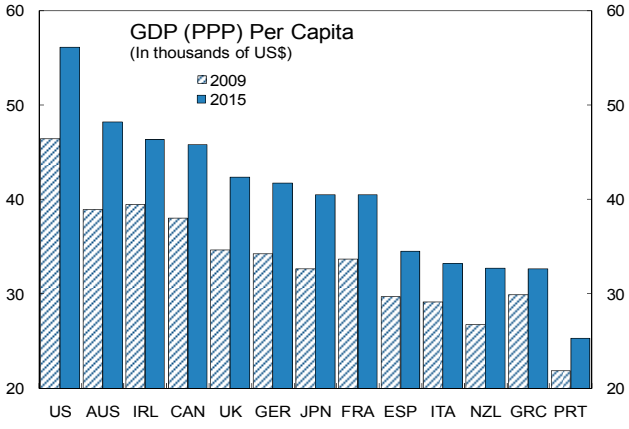
The difference in the potential growth estimates for Australia and New Zealand (0.8 percentage point) is similar to pre-crisis levels during 2005–2008, and can be explained largely by differences in capital stock growth. New Zealand experienced a much sharper investment fall in 2009 than Australia. Looking ahead, an expected rise in the cost of capital as a result of the global crisis is expected to weigh on New Zealand's investment and capital accumulation, adding to the pressure on potential growth from an aging population. For Australia, investment is expected to be less affected by a higher cost of capital, thanks to stronger demand for resources and larger terms of trade gains.

Among major advanced countries, Australia's growth potential over the medium term clearly stands out as the best. This in part reflects Australia's strong linkages to fast-growing Asian economies (see text charts below). For a similar reason, New Zealand's growth potential is projected to be slightly higher than that of many other advanced countries. However, at this pace, New Zealand is unlikely to narrow the sizable income gap with Australia.









1/ Weighted by average trade exports of 2006-08 to all partner countries.

Sources: WEO; and author's calculation.

Table 1. New Zealand: Path for Potential Output Growth Components

	1986-94	1995-99	2000-04	2005-08	2009	Projections 2010	2011	2012	2013	2014	2015
Potential Growth, percentage change	1.8	3.2	3.3	2.5	1.6	2.0	2.1	2.2	2.2	2.3	2.3
Capital Services, percentage change	2.5	3.0	3.3	3.4	1.6	2.0	2.4	2.6	2.8	2.9	3.0
Stock of Capital, percentage change	2.1	2.7	3.1	3.4	1.6	2.0	2.4	2.6	2.8	2.9	3.0
Capacity Utilization, percentage change	0.3	0.3	0.3	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Capacity Utilization, percentage points	87.1	89.3	90.6	91.1	91.0	91.0	91.0	91.0	91.0	91.0	91.0
Labor Services, percentage change	0.4	1.9	2.1	1.2	0.9	1.3	1.1	1.2	1.1	1.1	1.1
NAIRU, percentage change	-0.4	0.3	0.3	0.0	-0.1	0.1	0.1	0.1	0.1	0.1	0.1
NAIRU, percentage points	7.2	7.2	5.5	4.9	5.1	5.0	4.9	4.8	4.7	4.6	4.5
Labor force participation rate, percentage change	-0.2	0.3	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Labor force participation rate, percentage points	64.6	64.9	66.3	67.8	68.4	68.7	69.0	69.3	69.6	69.8	70.1
Average weekly working hours per employee, percentage change	0.0	0.0	-0.3	-0.6	-0.7	-0.5	-0.5	-0.4	-0.4	-0.4	-0.4
Working age population, percentage change	1.0	1.2	1.6	1.4	1.3	1.3	1.1	1.0	1.0	1.0	1.0
Total Factor Productivity, percentage change	0.6	0.8	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Contributions to Potential Output Growth 1/
(Percentage points)

	1986-94	1995-99	2000-04	2005-08	2009	Projections 2010	2011	2012	2013	2014	2015
Potential Growth	1.8	3.2	3.3	2.5	1.6	2.0	2.1	2.2	2.2	2.3	2.3
Capital Services	0.9	1.1	1.3	1.4	0.6	0.8	0.9	1.0	1.1	1.2	1.2
Stock of Capital	0.8	1.0	1.2	1.3	0.7	0.8	0.9	1.0	1.1	1.2	1.2
Capacity Utilization	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Labor Services	0.3	1.2	1.3	0.7	0.5	0.8	0.7	0.7	0.7	0.7	0.7
NAIRU	-0.2	0.2	0.2	0.0	-0.1	0.1	0.1	0.1	0.1	0.1	0.1
Labor force participation rate	-0.1	0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2
Average weekly working hours per employee	0.0	0.0	-0.2	-0.4	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2
Working age population	0.6	0.8	0.9	0.9	0.8	0.8	0.7	0.6	0.6	0.6	0.6
Total Factor Productivity	0.6	0.8	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Sources: Statistics New Zealand, and author's estimates.
1/ Output-labor elasticity assumed to be 0.6 and output-capital elasticity assumed to be 0.4.

Table 2. Australia: Path for Potential Output Growth Components

	1986-94	1995-99	2000-04	2005-08	2009	Projections 2010	2011	2012	2013	2014	2015
Potential Growth, percentage change	3.2	3.7	3.4	3.3	3.1	3.2	3.1	3.1	3.1	3.1	3.1
Capital Services, percentage change	3.1	3.2	3.6	4.8	4.4	4.5	4.4	4.8	4.9	5.0	4.9
Stock of Capital, percentage change	3.1	3.2	3.4	4.6	4.4	4.5	4.4	4.8	4.9	5.0	4.9
Capacity Utilization, percentage change	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity Utilization, percentage points	80.9	80.8	81.1	81.8	82.0	82.0	82.0	82.0	82.0	82.0	82.0
Labor Services, percentage change	1.6	1.6	1.7	1.8	1.8	1.7	1.6	1.4	1.4	1.4	1.4
NAIRU, percentage change	-0.1	0.3	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
NAIRU, percentage points	8.3	7.9	6.3	5.2	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Labor force participation rate	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Labor force participation rate, percentage points	62.7	63.3	63.8	64.5	64.7	64.8	64.9	65.0	65.0	65.1	65.2
Average hours worked per employee, percentage change	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Working age population, percentage change	1.6	1.4	1.5	1.7	1.9	1.9	1.7	1.6	1.5	1.5	1.5
Total Factor Productivity, percentage change	1.0	1.5	0.9	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4

Contributions to Potential Output Growth 1/
(Percentage points)

	1986-94	1995-99	2000-04	2005-08	2009	Projections 2010	2011	2012	2013	2014	2015
Potential Growth	3.2	3.7	3.4	3.3	3.1	3.2	3.1	3.1	3.1	3.1	3.1
Capital Services	1.2	1.2	1.4	1.9	1.8	1.8	1.8	1.9	2.0	2.0	1.9
Stock of Capital	1.2	1.2	1.4	1.8	1.8	1.8	1.8	1.9	2.0	2.0	1.9
Capacity Utilization	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Labor Services	1.0	1.0	1.0	1.1	1.1	1.0	1.0	0.9	0.8	0.8	0.8
NAIRU	-0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Labor force participation rate	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average hours worked per employee	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Working age population	1.0	0.9	0.9	1.0	1.1	1.1	1.0	0.9	0.9	0.9	0.9
Total Factor Productivity	1.0	1.5	0.9	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4

Sources: ABS, and author's estimates.
1/ Output-labor elasticity assumed to be 0.6 and output-capital elasticity assumed to be 0.4.

Table 3. Elements of Australia and New Zealand Potential Growth Projections

	AUS	NZL
Investment and capital stock	Investment is projected to grow, on average, 6.2 percent annually during 2010-15, below the pre-crisis average of 6.7 percent during 2000-07. The path of capital stock is obtained using a perpetual inventory method and an estimated annual depreciation rate of 6 percent.	Investment is projected to grow, on average, 5.8 percent annually during 2010-15, below the pre-crisis average of 6.4 percent during 2000-07. The path of capital stock is obtained using a perpetual inventory method and an estimated annual depreciation rate of 5 percent.
Capacity utilization	For simplicity, equilibrium capacity utilization remains constant during 2010-15.	For simplicity, equilibrium capacity utilization remains constant during 2010-15.
Working age population	Reflecting demographic trends, the growth rate declines from 1.9 percent in 2009 to 1.5 percent by 2015	Reflecting demographic trends, the growth rate declines from 1.3 percent in 2009 to 1 percent by 2015.
NAIRU	To remain broadly constant at the norm of 5 percent.	To decline gradually to the norm of 4½ percent.
Labor participation rate	The upward trend of labor participation rate is expected to continue.	The upward trend of labor participation rate is expected to continue, reflecting the impact of planned structural reforms.
Average weekly hours worked	To continue declining at a similar rate.	To continue declining at a similar rate.
TFP growth	Given large uncertainties surrounding TFP estimates, future trend TFP growth is assumed to remain broadly constant at the 2005-09 average of 0.4 percent per annum.	Given large uncertainties surrounding TFP estimates, future trend TFP growth is assumed to remain broadly constant at the 2005-09 average of 0.4 percent per annum.

Source: author's estimates.

ANNEX I: POTENTIAL GROWTH 1987–2009

A simple production function framework is used to estimate potential output of Australia and New Zealand.[4] Potential output can be decomposed into: (i) capital stock; (ii) equilibrium capital utilization; (iii) trend working hours per employee; (iv) equilibrium rate of unemployment (or NAIRU); (v) trend labor force participation rate; (vi) working-age population; and (vii) trend TFP. Data sources are described in Annex II.

Annex Box 1: Growth Accounting Methodology

The growth decomposition begins by first calculating actual TFP according to:

$$tfp = y - \alpha l - (1-\alpha)(k + ku)$$

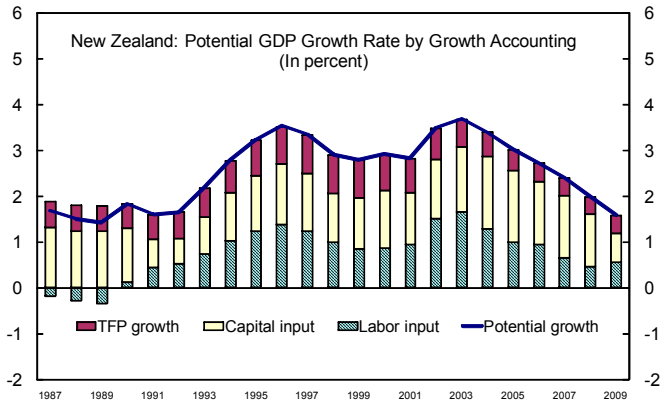
where lower case letters refer to the logarithm, y is output, k is the capital stock, ku is capital utilization, l is total labor hours, tfp is total factor productivity, and α is the labor income share. In this exercise, α is fixed over time at 0.6 for both Australia and New Zealand. Once TFP is obtained, potential output can be calculated as:

$$y^* = (1-\alpha)\, k + (1-\alpha)\, ku^* + \alpha\, h^* + \alpha\, (1-u^*) + \alpha\, lfp^* + \alpha\, wap + tfp^*$$

where h is average hours of work per employee, u is the unemployment rate, lfp is the labor force participation rate, and wap is working age population. Variables with * are trend values obtained using an HP filter with a smoothing parameter of 100. As standard in the literature, capital stock and working age population are not trend values. Given the end-point problem of an HP filter, trend values for the projection period of 2010–15 are not obtained using the filter. Rather, illustrative trend projections take account of historical path and future prospects.

Even prior to the global crisis, New Zealand's potential growth had declined since 2003.

- Thanks to reforms that increased labor market flexibility and productivity, the economy enjoyed a decade of robust potential growth since the mid-1990s, averaging 3¼ percent annually (Table 1). But potential growth peaked in 2003 and had declined since, largely driven by a slowdown in labor input



Source: author's calculation.

[4] The same approach was also used to estimate potential output of the U.S. and Canada. See IMF Country Report No. 09/229 and Estervao and Tsounta (2010). For features of Australian and New Zealand business cycles, see Cashin and Ouliaris (2004) and McDermott and Hall (2006).

and TFP growth. In contrast, investment during the same period grew at the fastest pace in the two decades prior to the recent global crisis.

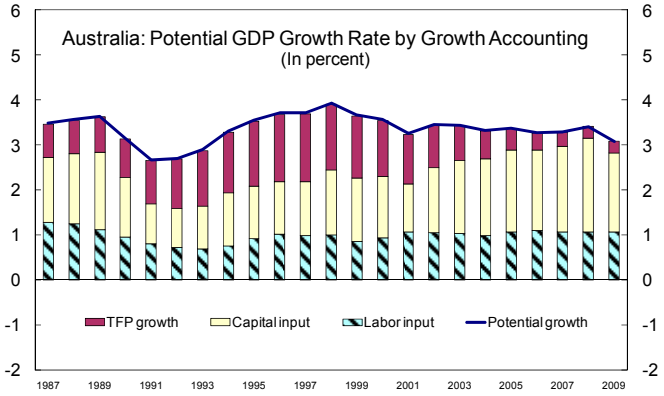
- The decline in labor input growth may reflect that growth-enhancing effects of labor reforms tapered off over time. In particular, working age population growth slowed sharply. Moreover, sizable declines in average working hours, which other advanced economies also experienced, reduced New Zealand's potential growth.

- It is unclear what drove down the TFP growth since the early 2000s. Recent research suggests that other net commodity exporters such as Australia, Canada, Chile, and Norway experienced a slowdown in TFP growth since the mid-2000s, which may have been attributable to market concentration, declining marginal gains from traditional sectors, and over-estimation of effective capital stock.[5]

The recent crisis accelerated the decline in potential growth, almost entirely through dampening investment. The potential growth rate is estimated to have fallen from 2½ percent in 2007 to 1½ percent in 2009. The decline is almost entirely driven by investment—private investment tumbled by about 20 percent during 2008–09. TFP growth, however, has held up during the recession. Trend labor input growth during the crisis was largely driven by the movement of working age population, with higher net migration increasing working age population growth from 1.2 percent in 2008 to 1.3 percent in 2009.

In contrast, Australia has enjoyed robust potential growth over an extended period.

- Australia's annual potential growth averaged close to 3½ percent during 1987–2008 (Table 2). At the same time, many other advanced economies, including New Zeeland, Canada, and the U.S., experienced steady declines in potential growth since the early 2000s. One important factor is Australia's investment boom in the resource sector.



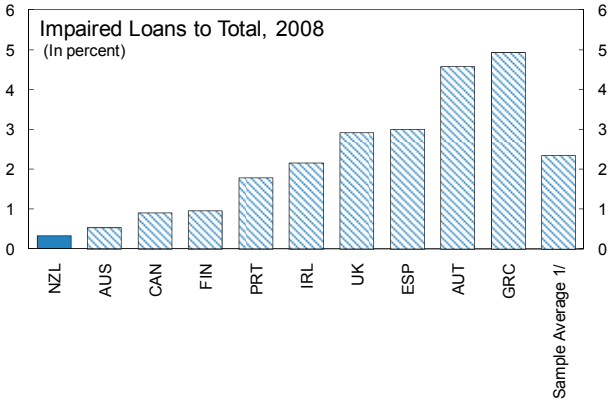
Source: author's calculation.

- Australia's potential growth was increasingly driven by investment and capital accumulation, while TFP growth declined steadily during the last decade.

[5] See Di Bella and Cerisola (2009).

- The global downturn had a fairly small impact on the Australian economy, as real investment barely contracted in 2009 and the unemployment rate went up by less than 2 percentage points. Not surprisingly, Australia's potential growth is estimated to have declined by just ⅓ percent to 3.1 percent in 2009. In comparison, New Zealand's decline in potential growth was only slightly smaller than that of Canada and the U.S. in 2009 (see text tables below).

Possible capital destruction could reduce the above potential growth estimates for 2009, amplifying the impact of the crisis. Specifically, for both Australia and New Zealand, assuming a 1 percent and 2 percent destruction of capital stock at end-2009 would reduce the potential growth estimates by ½ percent and 1 percent, respectively. However, given the shallow recession and low NPL ratios in both countries, it remains to be seen if the crisis has resulted in much capital destruction.



1/ Simple (unweighted) average of comparator countries, excluding New Zealand.

Comparisons of Potential Growth and Underlying Factors (1995–2009)

Australia: Contribution to Potential Growth
(In percent)

	1995-99	2000-04	2005-08	2009
Potential Growth	3.7	3.4	3.3	3.1
Capital Services	1.2	1.4	1.9	1.8
Stock of capital	1.2	1.4	1.8	1.8
Capacity utilization	0.0	0.1	0.1	0.0
Labor Services	1.0	1.0	1.1	1.1
NAIRU	0.2	0.2	0.1	0.0
Labor force participation rate	0.1	0.1	0.1	0.1
Average hours worked	-0.1	-0.2	-0.2	-0.2
Working age population	0.9	0.9	1.0	1.1
Total Factor Productivity	1.5	0.9	0.4	0.3

New Zealand: Contribution to Potential Growth
(In percent)

	1995-99	2000-04	2005-08	2009
Potential Growth	3.2	3.3	2.5	1.6
Capital Services	1.1	1.3	1.4	0.6
Stock of capital	1.0	1.2	1.3	0.7
Capacity utilization	0.1	0.1	0.0	0.0
Labor Services	1.2	1.3	0.7	0.5
NAIRU	0.2	0.2	0.0	-0.1
Labor force participation rate	0.2	0.3	0.3	0.2
Average hours worked	0.0	-0.2	-0.4	-0.4
Working age population	0.8	0.9	0.9	0.8
Total Factor Productivity	0.8	0.7	0.4	0.4

United States: Contribution to Potential Growth
(In percent)

	1995-99	2000-04	2005-08	2009
Potential Growth	3.4	2.8	2.4	1.4
Capital Services	1.6	1.2	1.0	0.6
Stock of capital	1.7	1.4	1.1	0.5
Capacity utilization	-0.1	-0.2	0.0	0.1
Labor Services	0.9	0.8	0.6	0.2
NAIRU	0.1	0.0	0.0	-0.5
Labor force participation rate	0.0	-0.1	-0.1	0.0
Average hours worked	0.0	0.0	-0.1	-0.1
Working age population	0.8	1.0	0.8	0.8
Total Factor Productivity	0.9	0.8	0.7	0.7

Canada: Contribution to Potential Growth
(In percent)

	1995-99	2000-04	2005-08	2009
Potential Growth	3.2	3.1	2.6	1.5
Capital Services	2.0	1.6	1.3	0.8
Stock of capital	1.9	1.7	1.6	0.9
Capacity utilization	0.1	0.0	-0.3	0.0
Labor Services	1.0	1.1	0.9	0.4
NAIRU	0.2	0.2	0.2	-0.2
Labor force participation rate	0.1	0.2	0.1	0.1
Average hours worked	-0.1	-0.1	-0.1	-0.1
Working age population	0.7	0.8	0.7	0.6
Total Factor Productivity	0.3	0.4	0.3	0.3

Sources: IMF Country Report No. 09/229; IMF Working Paper 10/13; and author's calculations.

ANNEX II: DATA SOURCES

(As of May 10, 2010)

New Zealand

- Quarterly data for **working age population, labor participation rate,** and **unemployment rate** for 1986–2009 are from Statistics New Zealand. Annual data are the average of four quarters.

- **"Weekly hours worked per employee"** equals "total weekly hours worked" divided by "total persons employed". Data are from Statistics New Zealand. Annual data are the average of four quarters.

- **Capital utilization** data are from NZIER *Quarterly Survey of Business Opinion.* Annual data are the average of four quarters.

- Data for "National account capital stock (CVS in 1995/96 prices) for year ended in March" during 1986–2009 are converted to **calendar year end capital stock** using quarterly investment data in the national accounts.

- **Quarterly GDP data** for 1986–2009 are from Statistics New Zealand. Annual data are the sum of four quarters.

Australia

- Quarterly or monthly data for **working age population, average weekly hours worked, labor participation rate,** and **unemployment rate** for 1986–2009 are from the Australian Bureau of Statistics.[6] Annual data are the average of quarterly or monthly data.

- Quarterly **capital stock** data for 1986–2009 are from the Modellers' Database of Australian Bureau of Statistics. Annual data are end of period capital stock data.

- **Capital utilization** data are from DataStream. Data prior to 1997 are unavailable and are assumed to be constant for simplicity.

- **Quarterly GDP data** for 1986–2009 are from the Australian Bureau of Statistics. Annual data are the sum of four quarters.

[6] The paper uses data in the Labor Force Survey, which suggests slightly lower population growth than the Estimated Resident Population release.

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