INTERNATIONAL MONETARY FUND

IMF Country Report No. 24/123

NEW ZEALAND

SELECTED ISSUES

May 2024

This paper on New Zealand was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on April 24, 2024.

Copies of this report are available to the public from

International Monetary Fund • Publication Services
PO Box 92780 • Washington, D.C. 20090
Telephone: (202) 623-7430 • Fax: (202) 623-7201
E-mail: publications@imf.org Web: http://www.imf.org

International Monetary Fund
Washington, D.C.

INTERNATIONAL MONETARY FUND

NEW ZEALAND

SELECTED ISSUES

April 23, 2024

Approved By
Asia and Pacific Department

Prepared By John Spray and Nour Tawk

CONTENTS

INFLATION IN NEW ZEALAND: DRIVERS AND DYNAMICS[1]

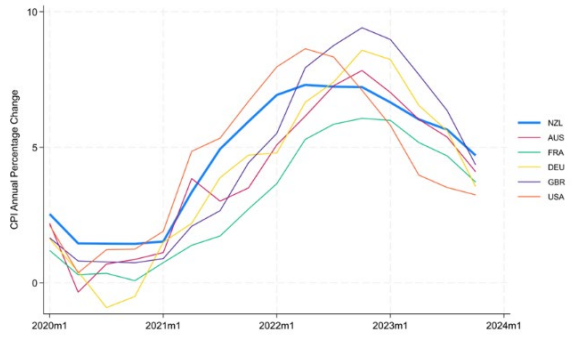
This paper investigates why New Zealand's inflation is higher and further from target than comparator economies considering two main hypotheses: (1) the persistence of pandemic era shocks; and (2) strong migration inflows fueling demand. The paper finds that, like in many advanced economies, expansionary fiscal and monetary policy, high global commodity prices, exchange rates, and high maritime transport costs all fed into higher inflation. However, unique for New Zealand, the delayed reopening of the economy likely caused a postponed demand shock relative to similar economies. Results show that the impact of these shocks decay rapidly over time, suggesting positive short-term inflation dynamics. With an eye for what lies ahead, the paper finds that large migration waves are associated with short-run increases in inflation, but that these effects are relatively modest and no longer significant after four years. Instead, the long-run dynamics show evidence that migration can lead to significant long-term gains to productivity, output, and capital growth. Countries with tight labor markets exhibit similar patterns to those without, except the inflationary effects of migration dissipate faster.

A. Introduction

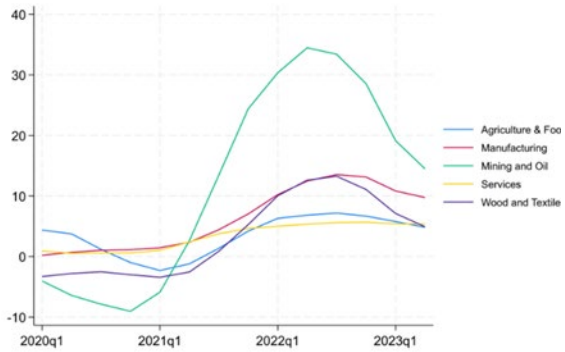
1. Inflation in New Zealand is higher and further from target than peers in advanced economies and the Asia-Pacific region. New Zealand's headline inflation reached 4.7 percent yoy in December 2023 down from a peak of 7.3 percent in 2022Q2, but still far above the inflation target band of 1 to 3 percent. While other advanced economies had higher peak inflation, New Zealand's trajectory has lagged behind its peers. For instance, many Asian economies are now experiencing inflation levels below target and, in some cases, even deflation.

Figure 1. CPI and PPI Inflation

A. CPI Inflation in Selected Advanced Economies
(Annual percent change, 3mma)



B. PPI Inflation in Selected Sectors
(Annual percent change, 3mma)



Sources: Consensus Forecasts; IMF WEO database; Haver; and IMF staff calculations.

[1] Prepared by John Spray and Nour Tawk.

2. The cost of production also remains elevated as demonstrated by high producer price inflation which is also broad based. Part of the cause of rising CPI inflation was higher global costs, as the pandemic caused shutdowns, transport costs rose, and regional conflicts disrupted supply-chains. As an integrated player in global supply-chains, New Zealand also experienced high PPI inflation which became broad-based across sectors.

3. The drivers of both the rise and persistence in inflation have created much discussion globally and in New Zealand but identifying the causal impact creates an empirical challenge. RBNZ Chief Economist Paul Conway said in a March 2023 speech "The COVID-19 pandemic and war and related events reduced the ability of the global economy to produce goods and services. Global supply chains were severely disrupted, especially for us living here in the South Pacific…resilient demand at a time of disrupted and limited supply causes inflation."[2] At the same time, New Zealand experienced large domestic shocks including rapid shifts in monetary policy, fiscal expansion, as well as record levels of inward migration. RBNZ estimates suggest almost half of headline inflation over the pandemic originated offshore, and Treasury staff have estimated that inflation was driven approximately half by supply-side drivers and half by demand-side drivers.[3] Earlier IMF staff analysis also suggests that the post-pandemic surge in inflation was driven by both global and domestic factors, and global factors, such as supply disruptions, played a larger role.[4] In order to identify the causal impact of each of these concurrent shocks requires a rich empirical model which incorporates global production prices across major economies as well as global input-output linkages and a dataset on sector-time-specific shocks.

4. This paper quantitatively investigates the drivers and dynamics of inflation in New Zealand in two sections:

Section B considers the drivers and persistence of pandemic era inflation. The section first investigates recent trends in four potential inflation drivers: fiscal policy, monetary policy, global price shocks, and lockdown (and reopening) demand and supply shocks. The section then presents an empirical model to separately identify the impact of each of these channels in a global dataset which allows the decomposition of the main inflation drivers in New Zealand and to estimate the persistence of each of these effects. This section finds that:

- **Drivers:** Expansionary fiscal and monetary policies, high global commodity prices, exchange rates, transport costs, and pandemic era demand shocks all made major contributions to inflation. It is shown that after the lockdown reopening demand-led inflation is the largest driver of post-2021 inflation. Of this, foreign lockdown demand shocks contributed over 20 percent of New Zealand's demand driven inflation.

[2] Paul Conway Speech to KangaNews "The path back to low inflation in New Zealand", March 2023

[3] Treasury FEU Special Topic: Decomposing inflation into supply and demand drivers, April 2023

[4] See the 2022 IMF New Zealand Article IV Staff Report and Selected Issues chapter "Transitory or Persistent? The Recent Surge in New Zealand's Inflation" in the same consultation.

- **Dynamics:** New Zealand's lagged inflation dynamics is partly a consequence of the later reopening due to the zero COVID policy. However, the paper shows that the duration of these shocks lasts approximately one year, suggesting New Zealand should now be experiencing the tail end impact of the shocks but should now be anticipate more favorable inflation dynamics. In addition, lower imported inflation from lower global prices should help continue to bring down non-tradables inflation.

Section C considers the impact of migration on inflation and the broader macroeconomy. This also serves as a *forward-looking* element of analysis, given New Zealand's large and ongoing increase in overseas net migration since 2022. This paper uses a large panel of macroeconomic variables across 34 countries over 23 years to show the macroeconomic impact of large migration events. To address issues of endogeneity the paper uses an instrumental variables approach finding:

- **Drivers:** Migration has significant supply-side benefits including higher productivity and higher capital usage and no decline in native employment. Consequently, output increases significantly. It also is associated with demand-led inflation driven by higher consumption and higher housing costs.
- **Dynamics:** In general, the impact of migration on supply-side variables grows steadily over time leading to significant medium-term growth and productivity benefits. By contrast, the impact of migration on inflation peaks one year after the shock and is no longer statistically significant after four years. This appears to especially be the case among countries with tight labor markets.

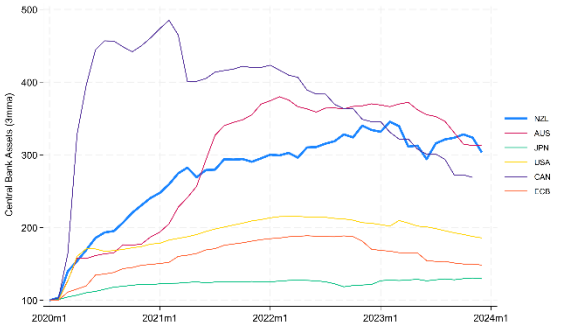
B. Identifying the Drivers and Persistence of Pandemic Era Inflation

Trends in Four Inflation Drivers (Monetary, Fiscal, Commodity Prices, Lockdowns and Re-openings)

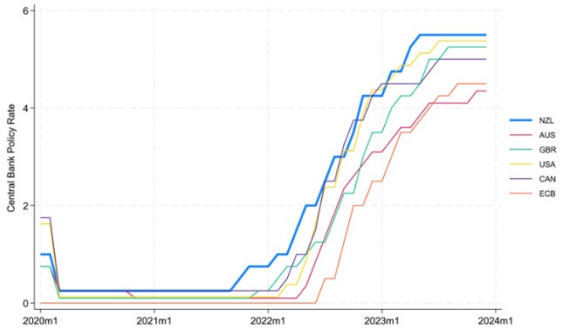
5. Monetary policy was initially accommodative but has recently turned restrictive through higher interest rates. The biggening of the pandemic saw the RBNZ support demand through a cut in the policy rate and a large quantitative easing package (as proxied in figure 2 through higher central bank assets). As the inflation dynamics turned, 2022 saw rapid hikes in the policy rate to try to get ahead of rising inflation.

Figure 2. Monetary Stimulus

A. Central Bank Assets Since Start of Pandemic
(Index, 2020m1=100, 3mma)



B. Policy Rate Since Start of Pandemic
(Percentage)

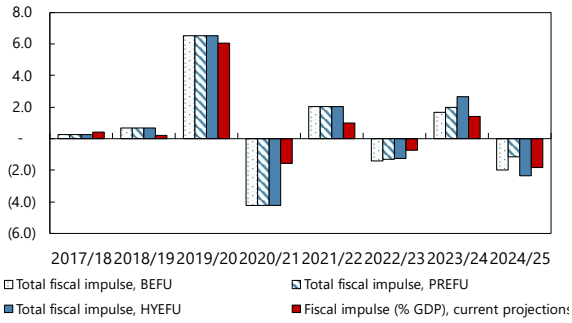


Sources: Haver and IMF Staff Calculations.

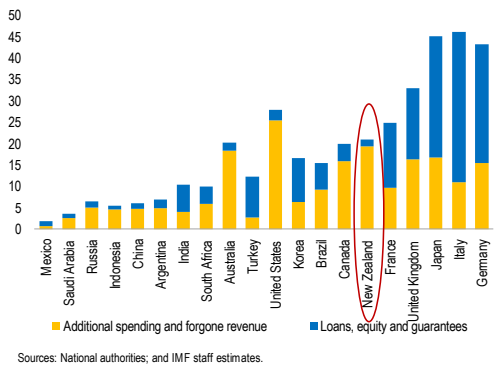
6. Fiscal policy was expansionary at the start of the pandemic and in response to the 2023 Cyclone Gabrielle. Like many other economies, New Zealand announced substantial fiscal support to households and businesses in 2020. While these policies were scaled back in 2021, the damage caused by Cyclone Gabrielle and later South Island flooding events in 2023 required fiscal support to again expand.

Figure 3. Fiscal Stimulus

A. Fiscal Impulse
(Percent of GDP)



B. Fiscal Measures in Response to the Pandemic
(Percent of GDP, data as of June 12, 2021)



Sources: Haver and IMF Staff Calculations.

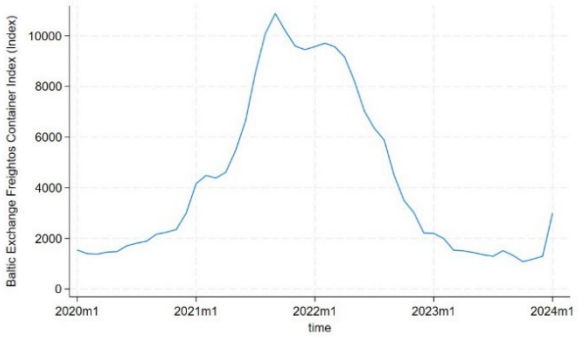
7. Global commodity prices fluctuated substantially while transport costs became disrupted in 2021/22. The pandemic led to large swings in commodity prices and transport costs as supply-chains were disrupted and demand fluctuated. More recently, regional conflicts led to higher gas prices and a resurgence in shipping cost due to disruptions.

Figure 4. Commodity Prices and Transport Costs

A. Selected Commodity Prices
(Annual percentage change, 6mma)

Sources: Haver and IMF Staff Calculations.

B. Maritime Transportation Costs
(Index)

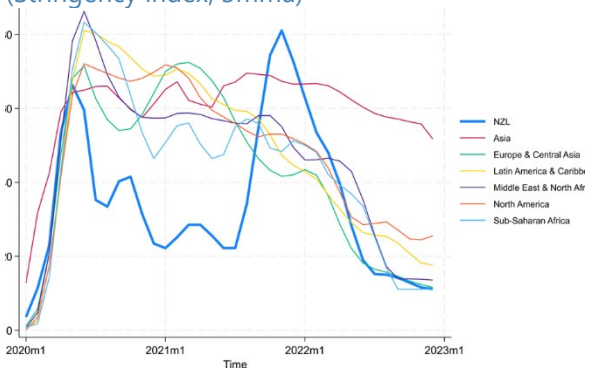


Source: Freightos Baltic Index.

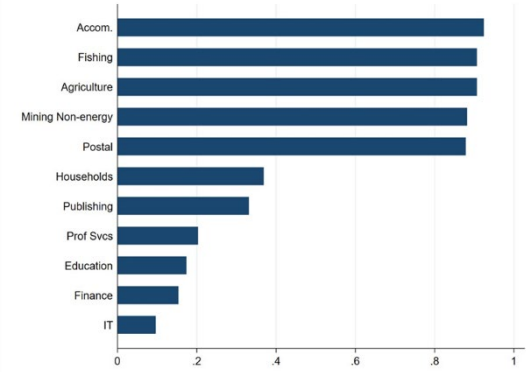
8. Re-openings following strict lockdowns created demand booms especially in sectors which were shut down by intensive lockdowns. The pandemic era was characterized globally by initially strict lockdowns followed by a gradual reopening (Figure 5A). This disrupted sectors differentially depending on their ease of working from home (Figure 5B). New Zealand followed a different trajectory from most of the rest of the world given it's zero covid policy allowed it to reopen in 2020 and 2021. However, a lack of immunity in the population meant that a second lockdown period in late 2021 meant a full reopening was later than most of the rest of the world.

Figure 5. Lockdown Intensity and Sectoral Variation

A. Lockdown Intensity over the Pandemic
(Stringency index, 3mma)



B. Ease of Working from Home by Sector
(Index, 1=not possible to work from home)



Sources: OxCGRT; O*Net; and IMF Staff Calculations.

An Empirical Model to Identify Drivers and Dynamics of Pandemic Era Inflation

9. This annex draws on two newly compiled datasets. First, this paper draws on a novel dataset of producer price inflation from 55 countries (including New Zealand) constituting 1195

country-sector pairs between 2020-2022.[5] This dataset is harmonized and merged with data on input-output linkages from the OECD's World Input Output Table. Second, the paper generates a lockdown intensity variable at the country-sector-month frequency, interacting the two variables shown in Figure 5. This is combined with data on fiscal and monetary stimuli, exchange rates, and transport costs from OxCGRT, Haver, OECD, and the IMF.

10. The following Local Projection regressions à la Jordà (2005) can be used to study the contemporaneous and dynamic effects of lockdowns and policy stimuli on producer prices:

$$\Delta p_{s,t+h} = \sum_{l \in \{0,3,6,9\}} \beta_l^S B_{s,t-l}^S + \sum_{l \in \{0,3,6,9\}} \beta_l^D B_{s,t-l}^D + \sum_{l \in \{0,3,6,9\}} \beta_l^F B_{s,t-l}^{Fiscal} + \sum_{l \in \{0,3,6,9\}} \beta_l^M B_{s,t-l}^{Monetary} + controls_{s,t} + u_{s,t}. \quad (1)$$

The four main explanatory variables are defined below, where the "network exposure share" is derived from a macroeconomic model of international production in a networked supply-chain, which can be found in Chau et al. (forthcoming).

i. Lockdown supply shocks $B_{s,t}^S = \sum_k SupplyExposure_{sk} \Delta\, lockdown_{kt}$ which combines the intensity of lockdowns in upstream sectors with the degree of supply-exposure.

ii. Lockdown demand shocks $B_{s,t}^D = \sum_c DemandExposure_{sc} \Delta\, lockdown_{ct}$ which combines the intensity of lockdowns in downstream sectors with the degree of demand-exposure.

iii. Fiscal stimulus shocks $B_{s,t}^{Fiscal} = \sum_c DemandExposure_{sc} \Delta\, FiscalStimulus_{ct}$ which combines the amount of fiscal stimulus in downstream sectors with the degree of demand-exposure.[6]

iv. Monetary stimulus shocks $B_{s,t}^{Monetary} = \sum_c DemandExposure_{sc} \Delta CentralBankAssets_{ct}$ which combines the change in central bank assets in downstream sectors with the degree of demand-exposure.

Controls include lagged producer prices, maritime transport costs, exchange rates, oil price shocks, and COVID cases.

Drivers of Inflation

11. Using the empirical model, it is possible to decompose the drivers of inflation in New Zealand. Figure 6 shows the main positive drivers of inflation in New Zealand in 2020 was lockdown supply-shocks (blue), followed by expansionary monetary policy (orange) and fiscal policy (green).

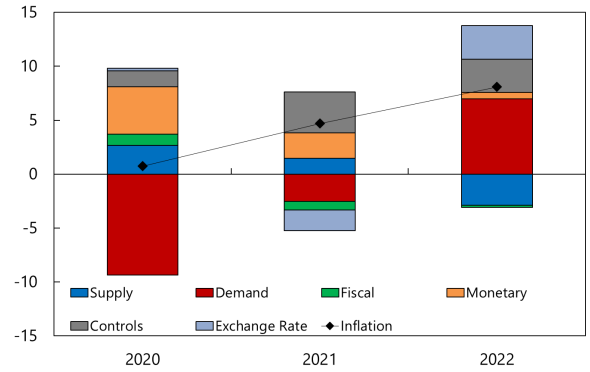
[5] This sample period was chosen to capture the impacts of the pandemic period. However, one might be concerned that the period was a particularly stark adjustments which might create concerns for external validity to more normal periods.

[6] One might be concerned about the comparability of fiscal measures across countries. While this is certainly a concern, we anticipate that this will just create noise in the sample as opposed to bias.

However, this was more than offset by lower demand due to lockdowns in downstream sectors (red). In 2021 and 2022 this story begins to reverse as lockdown reopening, globally, and in New Zealand, caused an increase in demand. This interacted with continued accommodative monetary policy, higher energy prices, exchange rate movements and transport costs to drive up inflation.

Figure 6. Headline Inflation Results

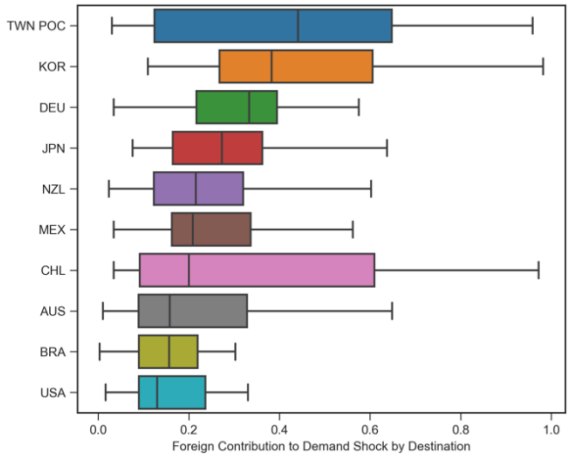
A. Inflation Decomposition in New Zealand
(Annual percentage change)



Sources: Chau et al, 2024
Notes: controls includes transport costs, energy prices, lagged inflation, and fixed effects

Source: Chau et al, forthcoming
Notes: This figure plots the predicted PPI inflation (outcome variable) due to subgroups of variables (contemporaneous and lags): lockdown-supply, lockdown-demand, and fiscal. In each subplot, each variable is aggregated by taking a weighted mean across sectors, with weights proportional to sectoral size (sales).

B. Foreign Contribution to Lockdown Demand Shock for Selected Economies
(Percentage)



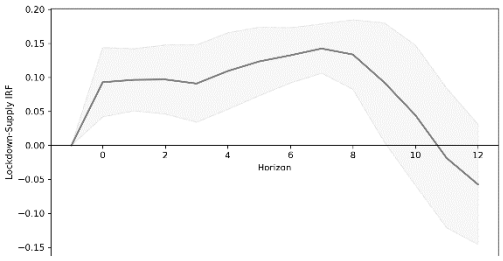
Source: Chau et al, forthcoming
Notes: this figure shows the foreign contribution to demand shocks for different economies. A value of 1 would imply all demand shocks were foreign and zero would imply all demand shocks were domestic. The figure plots the distribution of outcomes for countries across the full sample period. TWN POC refers to Taiwan Province of China

12. New Zealand will remain vulnerable to foreign supply and demand shocks going forward. Figure 6B shows that the foreign contribution to lockdown demand shocks in New Zealand made up over 20 percent of the total demand shock on average over the sample period. While this is less than some of the large manufacturing countries (e.g. Japan, Korea, Germany), it still represents a significant foreign component of demand-led inflation consistent with new Zealand's important position in global supply chains. It also suggests that the current disinflation taking place in global production (especially in China) should feed through into lower inflation in New Zealand.

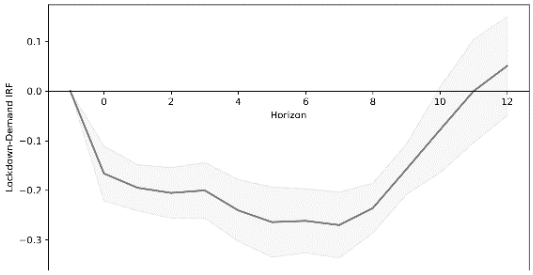
Dynamics

Figure 7. Impulse Response Functions from Supply and Demand Shocks

A. Impact of a Contraction in Supply x Months after Shock Incidence



B. Impact of a Contraction in Demand x Months after Shock Incidence



Source: Chau et al, forthcoming
Notes: This figure plots the results of local projection regressions (à la Jordà (2005)) for different forward horizons of PPI inflation in months on the Bartik instruments for the supply effect of lockdown (LHS), demand effect of lockdown (RHS). The y-axis plots the betas from the regression which are unitless.

13. Figure 7 shows impulse response functions for lockdown supply and demand shocks demonstrating that lockdown (and reopening) policies are strong and persistent drivers of global inflation, but should abate within a year. Panel (A) and (B) plots the β_l^S and β_l^D coefficients from equation (1) which show the impact on PPI inflation of a contraction in upstream supply chain and a contraction in downstream demand, respectively. While technically unitless, one can interpret the magnitude by considering the impact of a specific shock: Panel (A) - the contemporaneous effect of a full lockdown of a major supplier that accounts for 50 percent input costs would lead to a 5 percent PPI inflation in the affected sector; Panel (B) - a sector that sells 50 percent of its output to a locked-down country would experience a 9 percent deflationary impact. For both demand and supply shocks, the effects are both large and persistent – lasting for approximately 1 year. As such, given re-openings ended at the end of 2022, New Zealand is currently experiencing the tail end impacts of pandemic era inflation drivers are coming to an end.

One Possible Reason for this Process Taking Longer than Average in New Zealand may be the Role of High Net Migration. This is Explored in the Next Section of the Paper.

C. The Impact of Migration on Inflation and the Macroeconomy

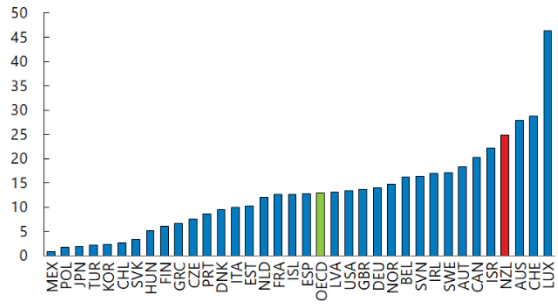
14. The impact of migration on the macroeconomy in New Zealand has long been a focus on research and policy. For instance, McDonald (2013) and Vehbi (2016) consider the implications of demographic shifts for the macroeconomic impulse, labor market and housing demand, highlighting the need for adaptive policy measures. Armstrong and McDonald (2016) complement these insights by examining the role of migration in shaping labor demand and labor supply in New Zealand. NZIER (2024) reviews the literature on migration and inflation arguing that the existing literature is inconclusive on the inflationary impact of migration. This section of this paper takes a

different approach in seeking to first document trends in migration in New Zealand and then considering what can be learnt from large migration waves across OECD countries.

Migration Trends and Characteristics in New Zealand

15. Overseas migration holds an important role for New Zealand. Historically, migration has been highly relevant for New Zealand and a steady and significant driver of population growth. Migration has been subject to variability over time, with fluctuations during some domestic or regional episodes, with the latest large surges coinciding with the end of the mining boom in Australia in 2019, and in the years following the Covid-19 pandemic. By 2016, roughly 25 percent of New Zealand's population was estimated to have been born overseas.

Figure 8. Foreign-Born Share of the Population, 2016
(Percent)

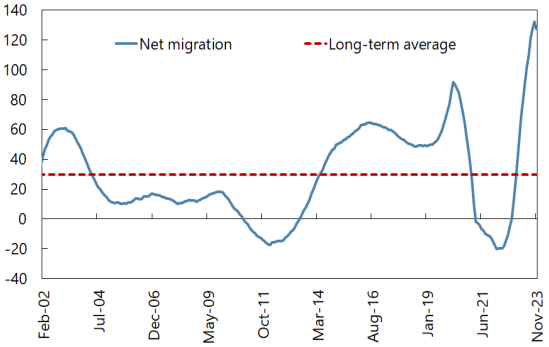


Source: OECD.

16. Net overseas migration is set to become more important in the future, as the rate of natural population increase declines. In the past decade, net overseas migration has significantly outpaced the rate of natural population increase, which has steadily declined, consistent with the fall in New Zealand's fertility rate to 1.56 percent in 2023, below the replacement rate needed for a generation to replace itself (2.1 percent). As a result, the rate of population growth has been driven by net overseas migration: net migration contributed to about 40 percent of population growth between 2001 and 2019, and explained the collapse in population growth during 2021, as well as the significant population growth in 2022 (82 percent of population growth) related to pandemic-related border closing. In 2023, net overseas migration reached historical levels (127,000 persons by November 2023), an estimated 2.4 percent of the 2023 population.

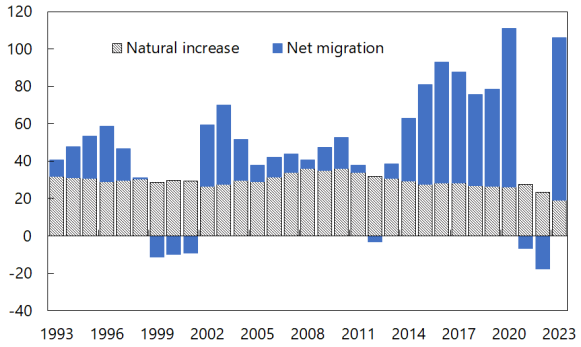
Figure 9. Net Migration Trends

A. Net Migration in New Zealand
(Thousands of persons)



Sources: Stats NZ., IMF staff calculations.

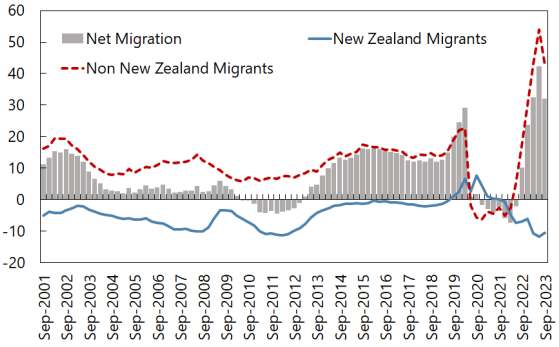
B. Net Migration and Rate of Natural Increase
(Thousands of persons)



Sources: Stats NZ.

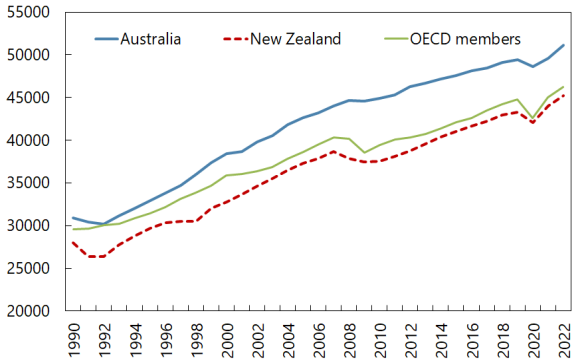
Figure 9. Net Migration Trends (Concluded)

C. New Zealand Migrants verses Others
(Thousands of persons)



Sources: Haver Analytics, IMF staff calculations.

D. GDP per Capita: New Zealand, Australia, and OECD
(Constant 2017 International USD)



Sources: OECD, World Bank.

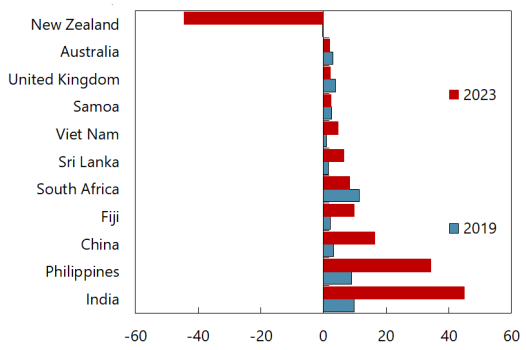
17. Net overseas migration has been accompanied by large emigration waves of New Zealanders. In 1973, New Zealand and Australia announced the Trans-Tasman Travel Arrangement (TTTA), an agreement which allowed New Zealanders and Australians to settle in each other's countries. Emigration of New Zealanders towards Australia accelerated following, especially as the gap between the countries' income levels grew, with New Zealand falling behind. On average, emigration to Australia averaged around 40 thousand New Zealanders until the onset of Covid-19. This number reached 34 thousand in 2022.

18. Migrants into New Zealand are comprising mostly skilled workers and students. Historically, the largest share of migrants into New Zealand consisted of Australian and New Zealand citizens, making about 35 percent of total migration, but these numbers have declined to about 13 percent post-pandemic. Work visas gained prominence in the past decade, and currently make the largest share of migrant arrivals, followed by visitor and student visas. In terms of nationality, migrants mainly came from Asia in 2023, from the Philippines, India, and China, as well as the Pacific Islands (Fiji, Samoa). Correspondingly, the largest share of emigrants are New Zealanders.

19. Migrants coming into New Zealand are highly educated. Forty-two percent of migrants into New Zealand have achieved a tertiary-level education. This level exceeds that of the native-born population: the difference between the shares of tertiary-educated among the native-born and migrant populations is one of the biggest among OECD countries, with a gap of 17 percentage points. In addition, the difference in literacy mean scores between the migrant-born and native-born populations is small, among the lowest across OECD countries. Previous research has identified that the skill-level of migration can be very important to aggregate outcomes, especially when interacted with the business cycle (Smith and Theonissen, 2019).

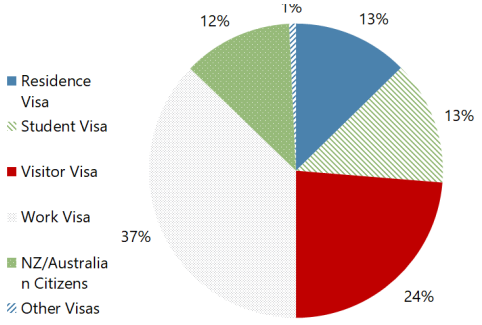
Figure 10. Migrant Characteristics

A. Estimated Net Migration by Selected Citizenship
(Thousands of persons)



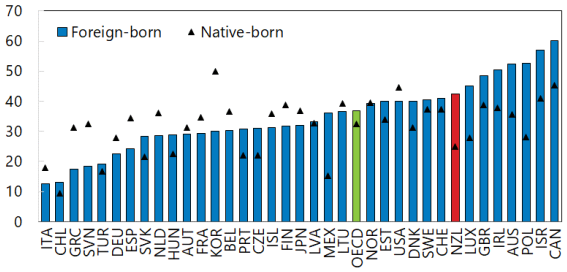
Sources: Stats NZ.

B. Long-Term Migrant Arrivals by Visa Type
(Percent, 2023)



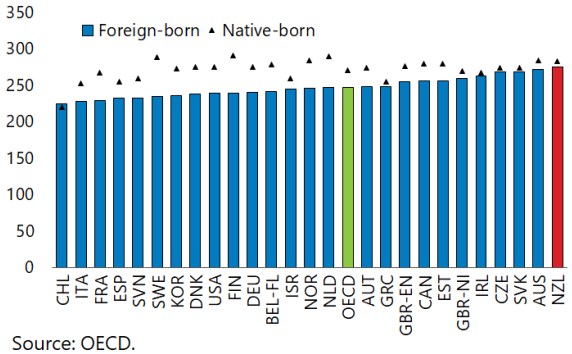
Sources: Haver Analytics, IMF staff calculations.

C. Share of Highly Educated (16-64 Years)
(Percent, 2016)



Source: OECD.
Note: Highly-educated is tertiary (ISCED 5-8) attainment. Canada and New Zealand include people still in education.

D. Mean Literacy Scores
(Score, 2016)



Source: OECD.

Economic Impact of Migration

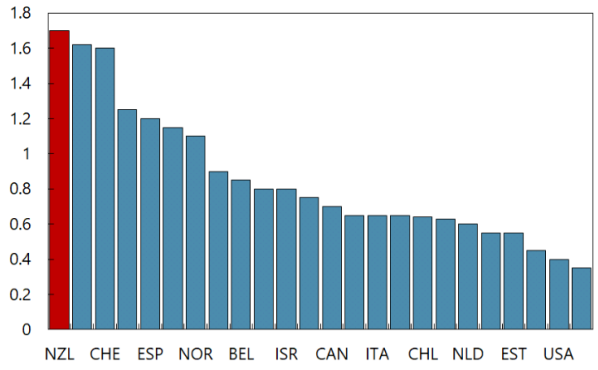
20. Migration affects both the supply- and demand-side of the economy, but disentangling which effect dominates over different time horizons is an empirical challenge. On the one hand, migration can boost productivity, raise human capital, and address supply-side bottlenecks in the labor market. On the other hand, migration can increase demand for amenities leading to higher housing costs and cause higher real consumption. This could lead to increased inflation. In order to identify which effect is dominant and over which time horizon requires a large panel of migration events and a credible identification strategy.

21. Cross-county instrumental variable analysis is employed to identify causal relationships between migration and macroeconomic outcomes. Disentangling macroeconomic effects of migration from the drivers of migration is challenging: non-humanitarian migration, particularly migration of students and skilled workers that is dominant in New Zealand, is often driven by search of better economic opportunities (Grogger and Hanson, 2011), which makes identifying causal effect difficult: is migration driving better economic opportunities or are better

economic opportunities attracting migrants? The idea is therefore to focus on push factors of migration to avoid confounding the effects of pull factors on macroeconomic (dependent) variables that result in reverse causality. We therefore focus on large immigration waves and construct an instrument variable that it is independent from economic conditions in the recipient country, allowing us to isolate the impact of the migration inflow episode. We use this method to assess the impact of migration on growth, consumption, investment, productivity, prices, and the housing market.

22. A cross country panel is used to assess the impact of migration on macroeconomic outcomes. We follow Engler et al. (2023) who measure the dynamic economic effects of immigration on a destination country, combining episodes of large immigration waves with an instrumental variable (IV) technique, using an OECD panel database of 34 countries, with data from 1995 to 2018. As a first step, the methodology identifies large immigration waves[7] for each of the countries in the database, given that large immigration episodes are historically more likely to be driven by external factors (such as negative events in source countries), rather than high economic prospects in recipient countries. As a second step, and to mitigate reverse causality (Card (2001), Peri and Sparber (2009)), an IV technique is constructed, based on the total immigration from other countries, and the share of immigrants already hosted in the destination country. The approach follows the literature (Beine, Docquier, and Ozden, (2011)), which documents that migrants from a given source country typically choose destination countries which already host large numbers of immigrants from their own source country.

Figure 11. Average Size of Immigration Shock, Per Country
(Percent of population)



Sources: OECD, IMF (2020), and IMF staff calculations.

23. Estimations using local projections methodology (Jordà, 2005) confirm an impact of migration shocks on large set of macroeconomic outcomes. Specifically, we estimate the effect of migration shocks on macroeconomic variables using the following regression:

$$y_{i,t+h} - y_{i,t-1} = \alpha_i^h + y_t^h + \beta_1^h \frac{\Delta IM_{it}}{E_{i,t-1}} + \Delta X_{i,t-1} + \varepsilon_t^h \quad (1)$$

Where $y_{i,t}$ are the macroeconomic outcome variable of interest which we subdivide into supply-side outcomes (unemployment rate, native-born employment, labor productivity, total factor productivity, capital-output ratios), demand-side outcomes (consumption and the housing price index) and net

[7] A large immigration episode is classified as such if the annual inflow of migrants in the host country (as a share of population) is greater than the host country's median inflow of migrants during the period 1980-2018 and is greater than the median inflow (as a share of population) experienced by all OECD countries during the previous five-year period and the following five-year period (Engler et al., forthcoming).

economic outcomes (output and inflation). The shock (independent) variable represents immigrant flows (ΔIM_{it}) relative to the previous period's total employment level ($E_{i,t-1}$). The specification also includes country and time fixed effects, to account for time-invariant country-specific and global factors that could affect macroeconomic outcomes. $X_{i,t-1}$ is a vector of lagged control variables, including the dependent variable, GDP growth, and employment.

At a second stage, the change in migration inflows is instrumented with:

$$\widetilde{\iota m}_{it} = \sum j \frac{M_{jit-5}}{M_{jt-5}} * \Delta M_{jt} \quad (2)$$

Where M_{jit-5}/M_{jt-5} is the share of the stock of migrants from origin *j* in destination *i* over the past 5 to 10 years, depending on data availability[8]. ΔM_{jt} is the total outflow of migrants, from origin *j* in year *t*. Data for the IV is winsorized at the top one percent to account for extreme values.

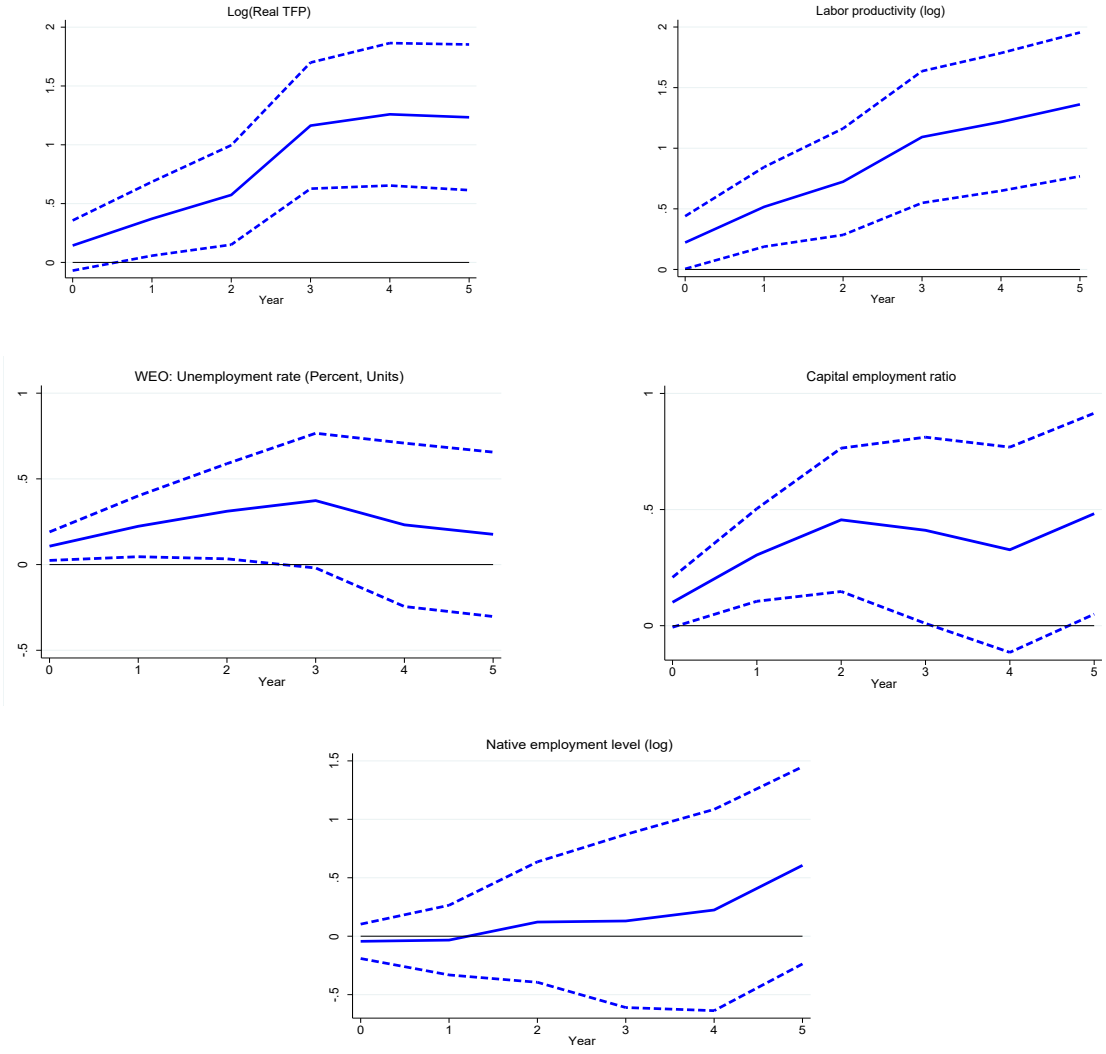
24. Large inward migration shocks have positive supply-side benefits. Results shown in Figure 12 suggests that labor productivity increases by almost 1 percent five years after a large migration shock. Total factor productivity (TFP) also increases following the migration shock, and the capital stock responds accordingly: as a result, the capital-labor ratio also increases in the short term. Migration inflows add to the labor supply, effectively raising the unemployment rate. Looking at employment growth in the native population, the results do not find adverse effects on native employment growth: employment in the native population rises modestly five years after the migration shock, but the increase is not statistically significant.

25. Large inward migration shocks also have significant demand-side impacts. Results shown in Figure 13 suggests house prices respond to a migration shock: the BIS nominal price index increases by 2 percent within four years, though the effect is statistically significant at the margin. Consistent with an increase in demand for housing, measures of housing affordability deteriorate as housing supply cannot react immediately: the house price-to-income ratio increases by about 2 percent within four years on the forecast horizon. However, the effect is no longer statistically significant by year 5. The impact on the house-price-to-rent ratio is less sensitive to the migration shock; although the index increases the response is not statistically significant. Results also show that real consumption increases consistent with population growth adding to domestic demand.

26. The net impact of large inward migration shocks is higher output and a short-run increase in inflation, but the long-run dynamics are favorable. Results shown in Figure 14 suggest that economic output increases by 1.2 percent by the fifth year following a migration shock. On the other hand, the peak impact on inflation occurs 1 year after the shock, where inflation increases by 0.2 percentage points. However, the effect declines over time and is no longer statistically significant after four years. This is consistent with large migrant waves causing short-term demand-led inflation but raising the productive capacity of the economy over the longer term.

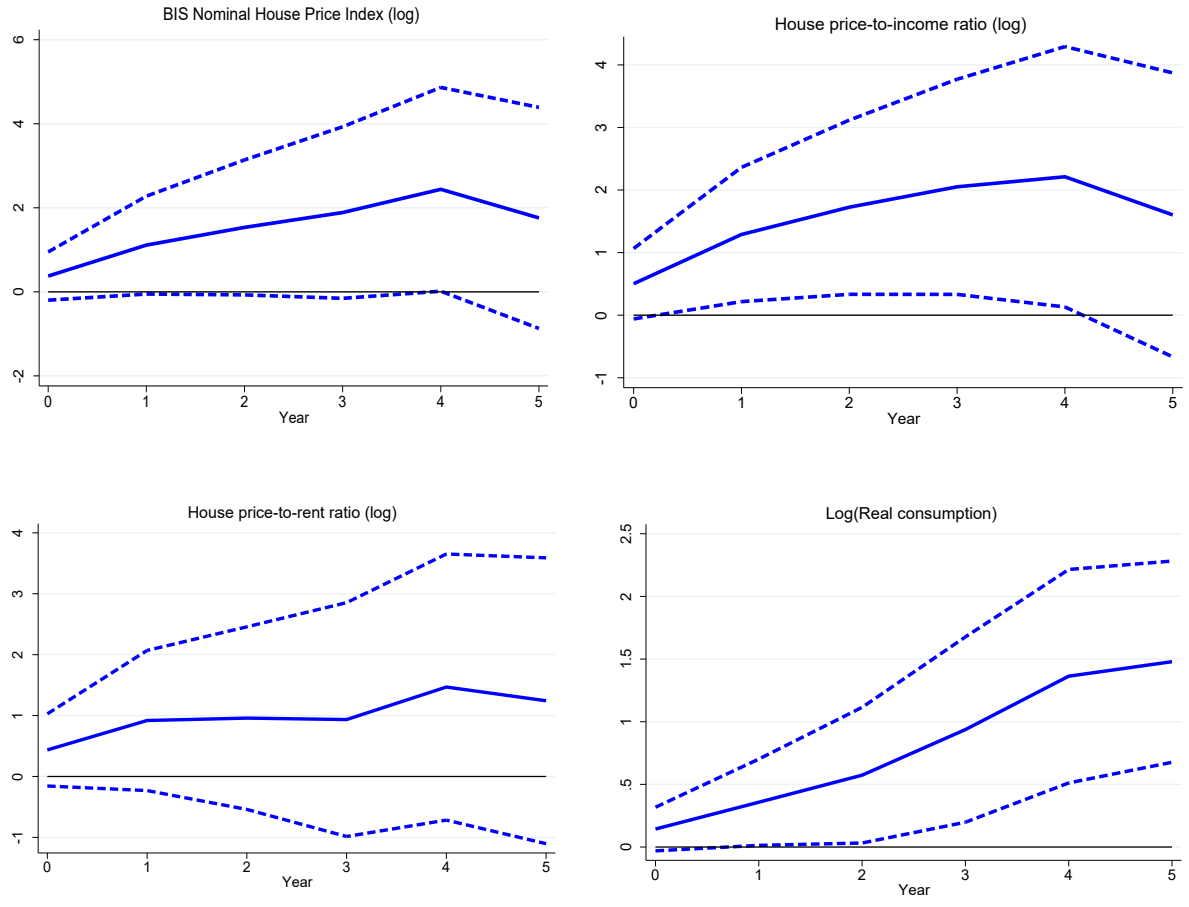
[8] Migration stock data is only available at five-year intervals.

Figure 12. Effects of Migration on Supply Side Variables



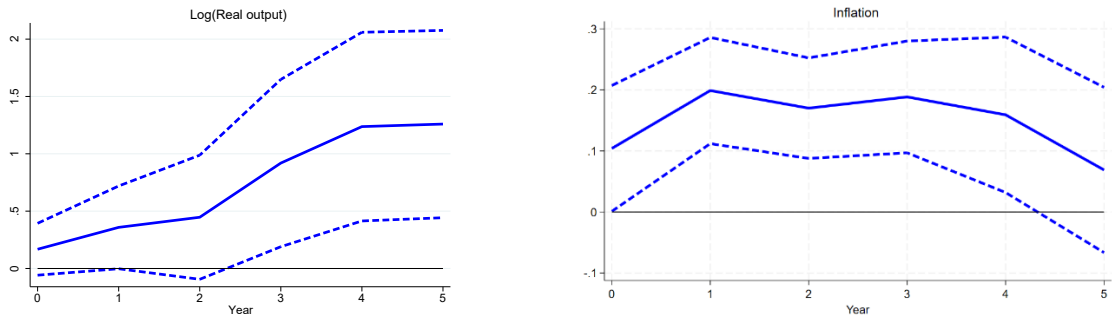
Source: IMF staff estimates.
Notes: Data is at the yearly level, for a sample of 34 countries from 1996 to 2018. Equation (1) is estimated using local projections methodology (Jordà, 2005), with 2SLS instrumental variables approach (equation (2)). Country and time fixed effects are included, to account for time-invariant country-specific and global factors. 90 percent confidence interval is shown.

Figure 13. Effects of Migration on Demand Side Variables



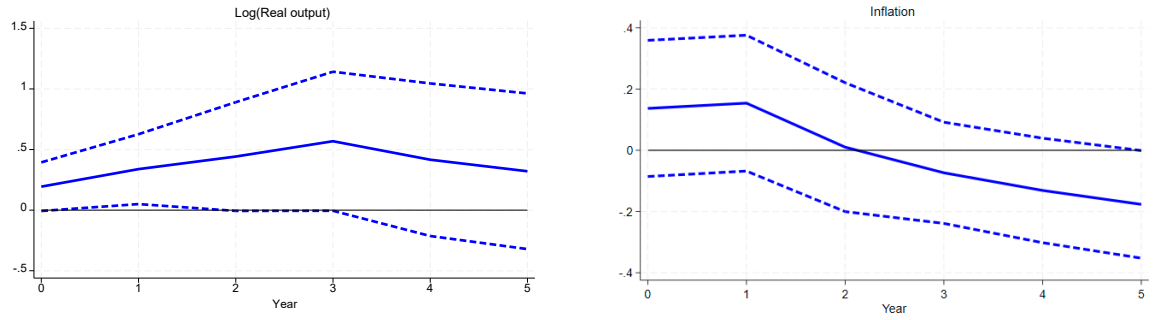
Source: IMF staff estimates.
Notes: Data is at the yearly level, for a sample of 34 countries from 1996 to 2018. Equation (1) is estimated using local projections methodology (Jordà, 2005), with 2SLS instrumental variables approach (equation (2)). Country and time fixed effects are included, to account for time-invariant country-specific and global factors. 90 percent confidence interval is shown.

Figure 14. Net Effects of Migration on Output and Inflation



Source: IMF staff estimates.
Notes: Data is at the yearly level, for a sample of 34 countries from 1996 to 2018. Equation (1) is estimated using local projections methodology (Jordà, 2005), with 2SLS instrumental variables approach (equation (2)). Country and time fixed effects are included, to account for time-invariant country-specific and global factors. 90 percent confidence interval is shown.

Figure 15. Net Effects of Migration on Output and Inflation when Tight Labor Market



Source: IMF staff estimates.
Notes: Data is at the yearly level, for a sample of 34 countries from 1996 to 2018. Equation (1) is estimated using local projections methodology (Jordà, 2005), with 2SLS instrumental variables approach (equation (2)). Country and time fixed effects are included, to account for time-invariant country-specific and global factors. 90 percent confidence interval is shown.

27. When labor markets are tight, migration waves have a smaller initial inflationary impact, and turns deflationary from year 2 to 5. Figure 15 runs a regression with a subset of countries who have tight labor markets. In the sub-sample, the impact of migration on inflation is no longer statistically significant and falls more rapidly than for the full sample. By year 2, the point estimate turns negative and by year 5 is negative and statistically significant. The impact on output follows a similar trajectory to the full sample, although the point estimate is somewhat lower. This is important information for New Zealand given the current migration wave came at a time of extremely tight labor markets.

28. The results are robust when subjected to different specifications. As first robustness check, we remove all lagged controls from the baseline specification (Annex Figure A1). As a second robustness check, we only include the lagged dependent variable as a control variable (Annex Figure A2). We find that, despite stripping the regression of its controls, most of the results remain consistent with our baseline specification. The results are also largely robust (available upon request) when estimating the effects of migration shocks and changing the lag structure in the regressions.

D. Conclusions

29. New Zealand's inflation dynamics have lagged those seen among similar economies. The core drivers appear to be expansionary fiscal and monetary policy, high global commodity prices, exchange rates, transport costs, and pandemic era demand shocks. While international demand factors are important, they make up approximately 20 percent of the total demand shock. Slower dynamics were likely influenced by New Zealand's later reopening and hence delayed demand shock. On average, pandemic era shocks tend to die out within a year suggesting New Zealand should benefit from short-term favorable inflation dynamics.

30. Migration likely to have major macroeconomic impacts. New Zealand experienced record levels of migration in 2023. Evidence from a large set of countries (including New Zealand)

suggests that on the one hand, large migration waves are associated with higher output, higher productivity, and increased capital usage. Yet, at the same time, migration can raise inflation due to migrant-led increases in real consumption and housing costs. Based on the sample of OECD countries, the dynamics are expected to be largely favorable: supply-side benefits take longer to impact than demand-led effects indicating more favorable future dynamics for New Zealand over the next five years. This appears to especially be the case among countries with tight labor markets. However, the New Zealand will need to stay vigilant to inflation surprising on the upside or an unruly pick-up in house prices or housing costs.

Annex I. Robustness

Figure I.1. Effects of Migration Inflow Shocks on Macroeconomic Outcomes, No Controls

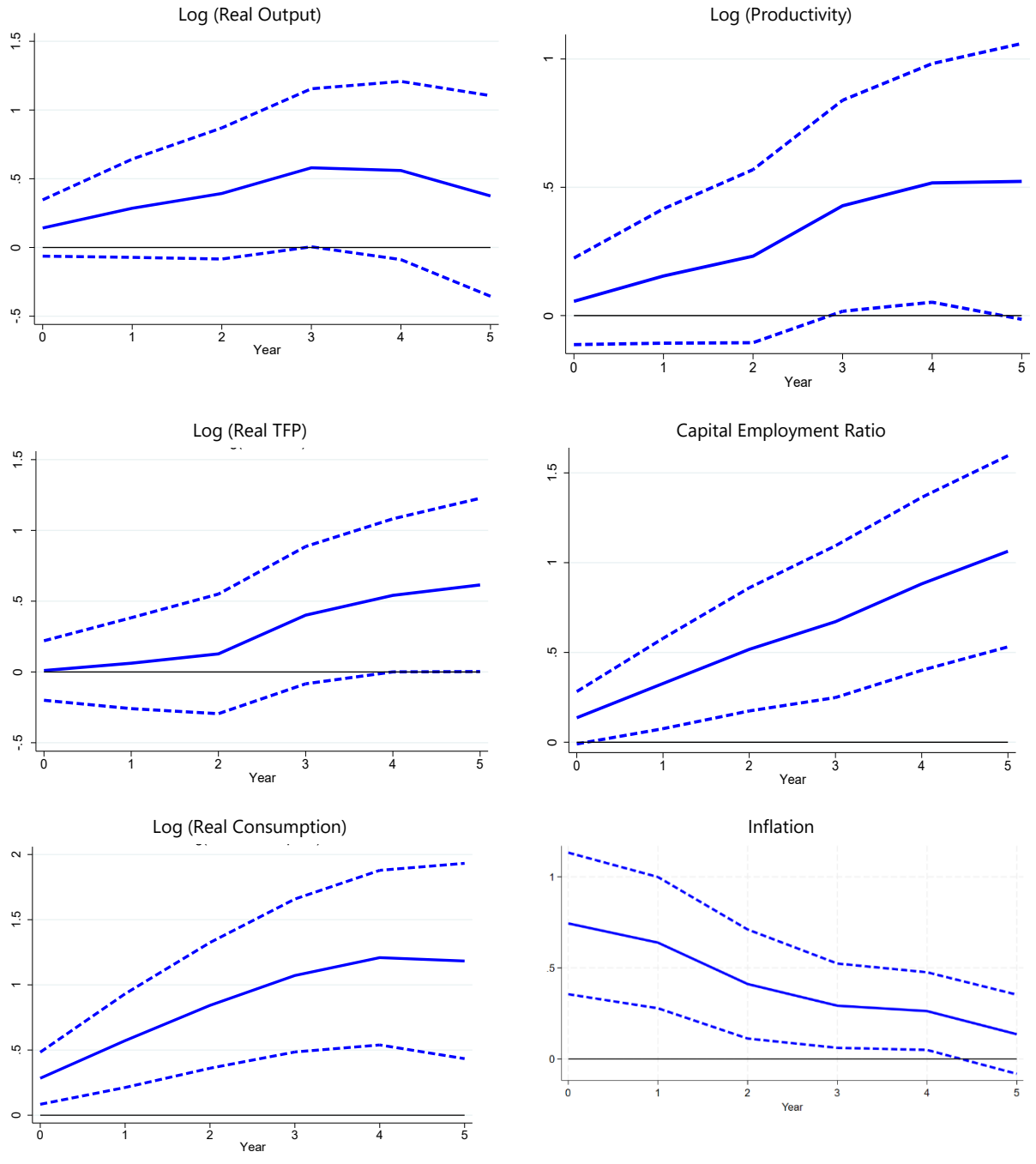
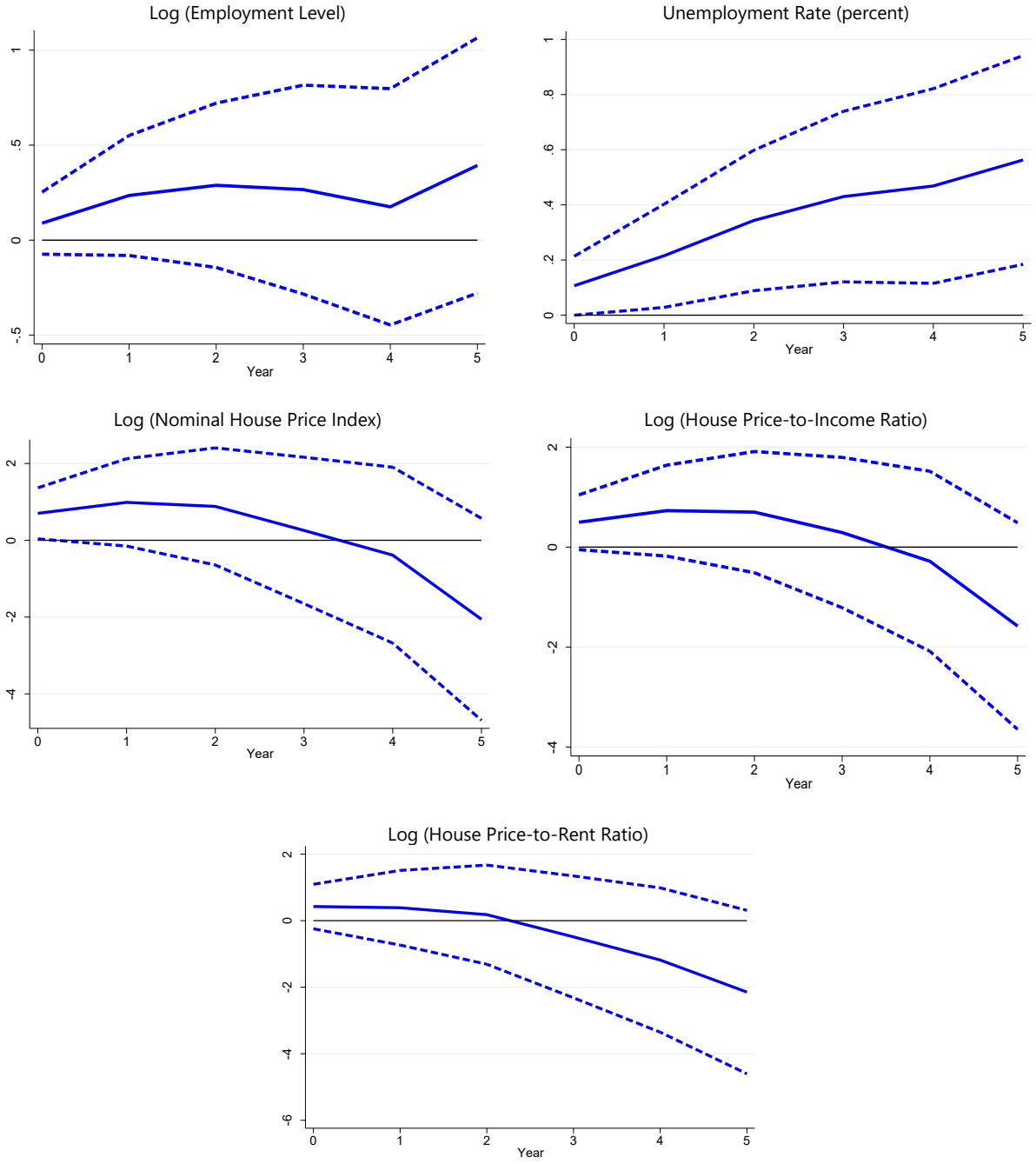


Figure I.1. Effects of Migration Inflow Shocks on Macroeconomic Outcomes, No Controls (Concluded)



Source: IMF staff estimates.
Notes: Data is at the yearly level, for a sample of 34 countries from 1996 to 2018. Equation (1) is estimated using local projections methodology (Jordà, 2005), with 2SLS instrumental variables approach (equation (2)). Country and time fixed effects are included, to account for time-invariant country-specific and global factors.

Figure I.2. Effects of Migration Inflow Shocks on Macroeconomic Outcomes, Including Lagged Dependent Variable

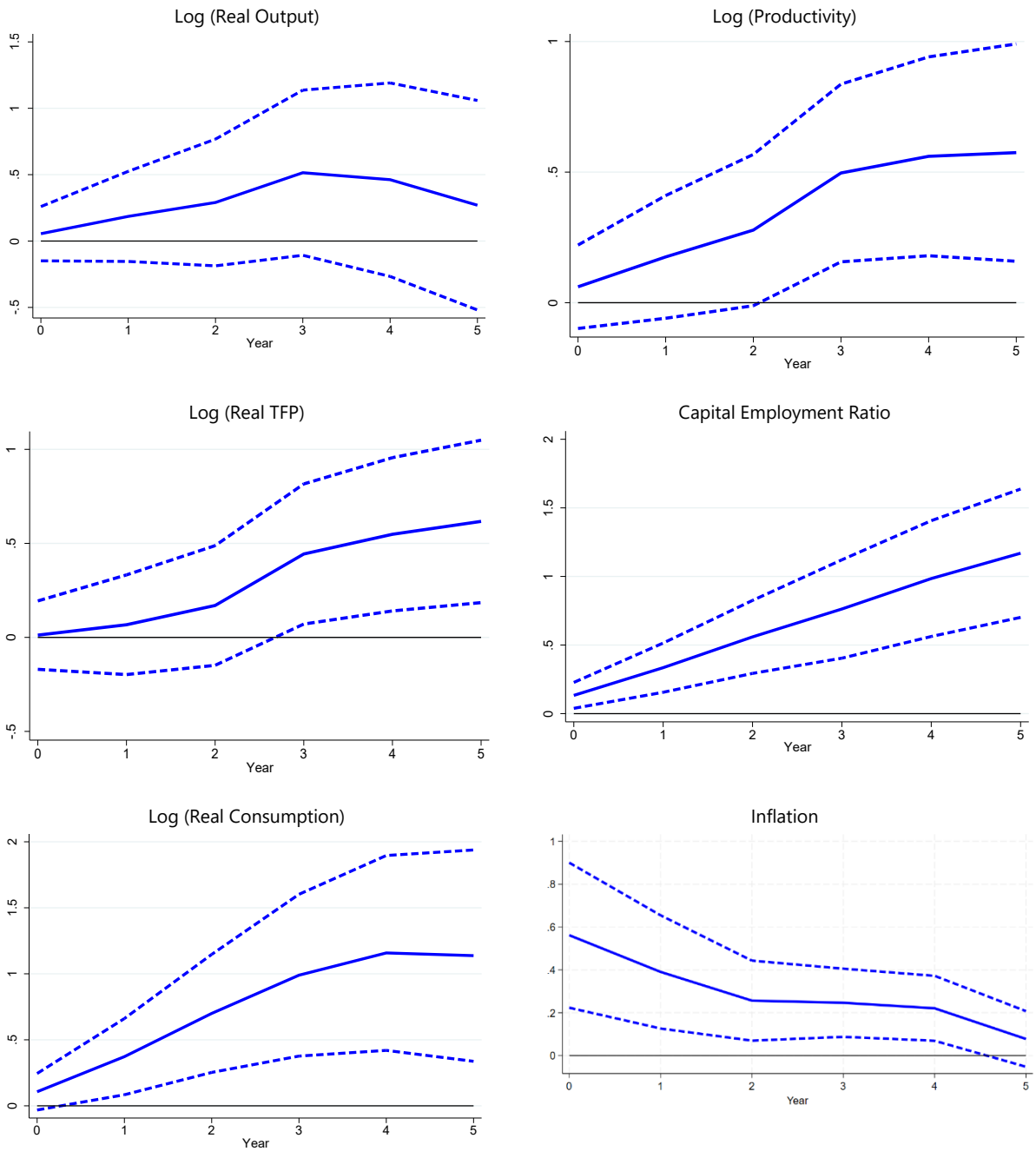
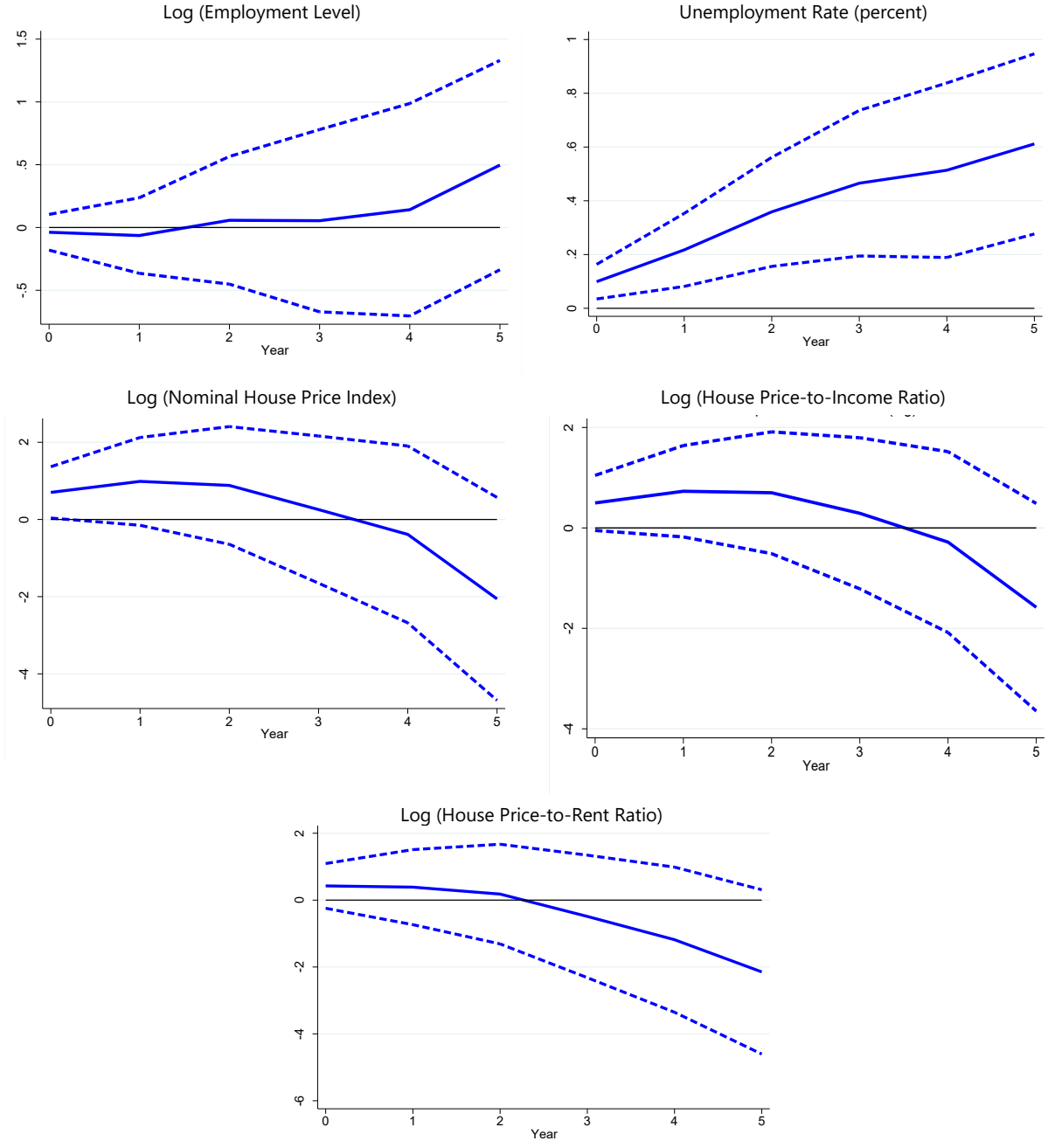


Figure I.2. Effects of Migration Inflow Shocks on Macroeconomic Outcomes, Including Lagged Dependent Variable(Concluded)



Source: IMF staff estimates.
Notes: Data is at the yearly level, for a sample of 34 countries from 1996 to 2018. Equation (1) is estimated using local projections methodology (Jordà, 2005), with 2SLS instrumental variables approach (equation (2)). Country and time fixed effects are included, to account for time-invariant country-specific and global factors.

References

Armstrong, Jed and Chris McDonald. 2016. "Why the drivers of migration matter for the labour market". *Reserve Bank of New Zealand Analytical Note Series*

Beine, M., F. Docquier, and C. Ozden. 2011. "Diasporas," *Journal of Development Economics*, 95(1): 30–41.

Card, David. 2001. "Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration." *Journal of Labor Economics* 19(1): 22–64.

Chau, V., Conesa Martinez, M., Kim, T. and J. Spray. Forthcoming. "Global Value Chains and Inflation Dynamics". IMF Working Paper.

Engler P., MacDonald M., Piazza R., and Galen Sher, Forthcoming. "The Macroeconomic Effects of Large Immigration Waves". IMF Working Paper.

Grogger, Jeffrey, and Gordon H. Hanson. 2011. "Income maximization and the selection and sorting of international migrants." *Journal of Development Economics* 95(1): 42-57.

International Monetary Fund, 2020. "The Macroeconomic Effects of Global Migration." IMF World Economic Outlook, Washington, DC.

Jordà, Òscar. 2005. "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review* 95(1): 161–82.

McDonald, Chris. 2013. "Migration and the housing market". *Reserve Bank of New Zealand Analytical Note Series*

NZIER. 2024. "Inflation and migration: Theory, evidence and implications for the Monetary Policy Committee"

Peri, Giovanni, and Chad Sparber. 2009. "Task Specialization, Immigration, and Wages." *American Economic Journal: Applied Economics* 1(3): 135–69.

Smith, Christie and Christoph Thoenissen. 2019, 'Skilled migration and business cycle dynamics', *Journal of Economic Dynamics and Control*

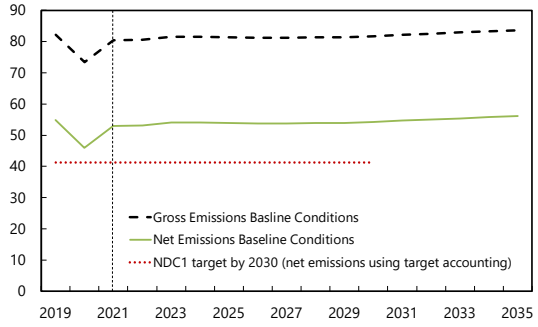
Vehbi, Tugrul. 2016. "The macroeconomic impact of the age composition of migration". *Reserve Bank of New Zealand Analytical Note Series*

MITIGATION OPTIONS TO MEET NEW ZEALAND'S CLIMATE GOALS[1]

Under baseline policies, it will be difficult for New Zealand to meet its 2030 Nationally Determined Contribution (NDC). Strengthening the incentives within the Emissions Trading Scheme (ETS) through a lower number of available units could help lower domestic emissions, but combining this with pricing methane emissions would be the most effective policy, reducing domestic emissions substantially further.

1. New Zealand has made an ambitious 2030 Paris climate pledge and has ambitious domestic emissions goals. New Zealand's Nationally Determined Contribution (NDC) set a headline target of a 50 percent reduction of net emissions below gross 2005 level by 2030. Separately, New Zealand has committed to reach a series of domestic emissions budgets and net zero emissions of all greenhouse gas (GHG) except biogenic methane by 2050. Given the country already has a high percentage of energy from renewables and given that New Zealand's largest emitting sectors are difficult to abate, the country has planned on meeting its NDC through a combination of domestic net emissions reductions and offshore mitigation. So far, no offshore mitigation has taken place.

2. Under baseline conditions, IMF Staff estimate New Zealand's domestic GHG emissions will remain flat. Forecasts are made using the IMF-WB's Climate Policy Analysis Tool (CPAT) and show the expected path of emissions should pre-existing policies remain in their current state of delivery.[2] IMF staff projections assume no tightening of existing policies and no new policies, and are more conservative than the official projections published by New Zealand Ministry for the Environment which estimates that with implemented and adopted policies as of 1 July 2023 gross and net (target accounting) emissions will fall by 16 and 31 percent respectively by 2030 from 2021 levels, in line with domestic emissions budgets. It is worthwhile acknowledging that modelling GHG emissions comes with substantial uncertainty given the future emissions trajectory depends on the realization of many uncertain outcomes including technological change, global mitigation, international fuel prices, and economic growth. Box 1 discusses some of the differences in modelling approaches taken by the IMF and New Zealand authorities in more detail.



Sources: IMF Climate Policy Analysis Tool

[1] Prepared by John Spray.

[2] These projections account for pre-existing policies, whose impacts are already implicit in currently observed fuel use and emissions, including carbon pricing, regulations, and fuel taxes/subsidies, with the current level or stringency of these policies held fixed.

3. If domestic emissions continue as expected, New Zealand would need to partake in a substantial international mitigation effort in order to meet its NDC.[3] Given New Zealand has yet to begin using international mitigation and given international markets for high quality carbon removals have so far been limited, an alternative policy would be to enhance the ambition of domestic mitigation.[4] If this is undertaken, it would be beneficial to make policy changes as soon as possible in order to minimize adjustment costs. IMF research has shown that gradual adjustment allows firms and workers more time to retrain and to invest in green technology. Similarly, a slow and predictable adjustment allows capital in high emissions sectors to be gradually decommissioned avoiding stranded assets.[5]

4. To move towards a more favorable domestic emissions trajectory the country could reform its already effective ETS. The ETS is the centerpiece of New Zealand's climate mitigation strategy as it provides an incentive for firms to either cut emissions or invest in carbon removals. Two illustrative scenarios were considered to show different policy options to help lower domestic emissions:

- In the first scenario (left panel), the ETS effective carbon price on gross emissions is raised by US$50 in 2024 and then gradually increased by an additional US$50 over the next six years.[6] This could be achieved through lowering the number of available units. As shown in the figures below, emissions begin to gradually decline through a broad reduction in emissions across several sectors. However, as the agricultural sector is not included in the ETS, the level of emissions from the agricultural sector remains constant. This is a major issue as the sector makes up approximately half of all emissions.

- In the second scenario (right panel), the increased effective carbon price on gross emissions is combined with a methane price of US$50 rising to US$100 by 2030. The fee could be based on farmer self-reporting and could be a pilot for larger administrations such as the EU.[7] This doubles the reduction in emissions relative to baseline as all sectors of the economy contribute towards lower emissions, including agriculture.

[3] The New Zealand authorities have an NDC on net emissions using a target accounting framework which does not include all forms of LULUCF. This is not separately estimated by the IMF CPAT model, so results on the international mitigation requirement should be considered as indicative.

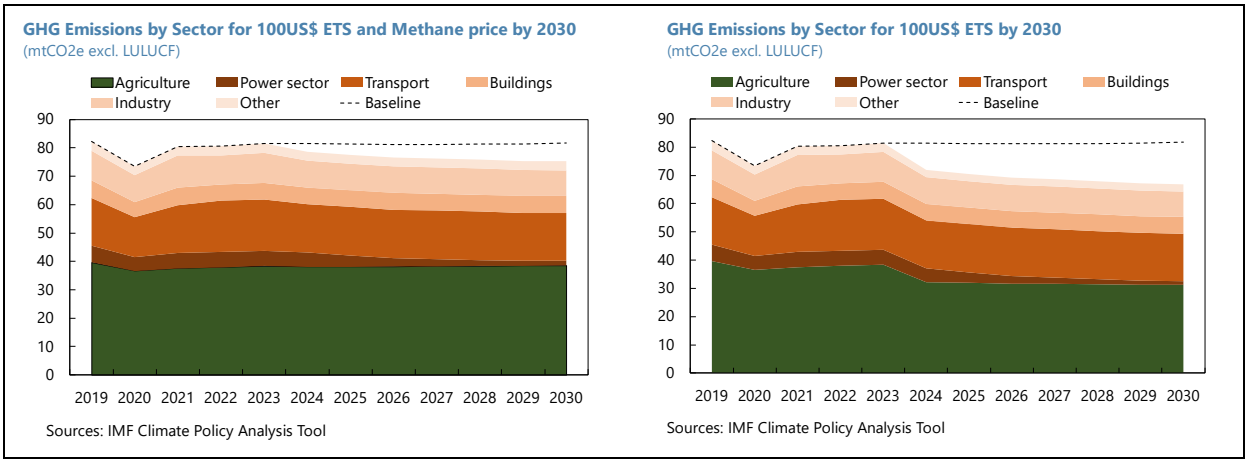
[4] If this policy were adopted it would also be important to evaluate trade offs between larger domestic emissions reductions and the cost to output and potential carbon leakage. The Climate Change Commission recommendations on domestic emissions budgets consider the impacts on GDP from the current trajectory and could be extended to consider larger reductions in domestic emissions (Climate Change Commission, 2021).

[5] See IMF Blog "Further Delaying Climate Policies Will Hurt Economic Growth"

[6] The policy is implemented as a de facto carbon tax in the model but calibrated to act like an increase in the effective emissions price of an ETS targeting gross emissions. The results should therefore be considered as illustrative more than quantitatively precise.

[7] It will be important to carefully calibrate the threshold level of emissions below which farmers are exempt from the pricing scheme to trade off compliance and administrative costs with emissions coverage.

While the exact results from these scenarios should be considered with caution,[8] the main qualitative conclusion remains clear: effective abatement can be achieved through the ETS, but this is most effective when combined with pricing agricultural emissions.



5. Additional policy options include feebates, strengthening incentives for gross emissions reductions in the ETS, and incentivizing R&D. New Zealand's ETS was designed to lower net emissions by allowing for the offsetting of emissions through carbon removals (for instance through afforestation). There are potential advantages to a greater focus on lowering gross emissions including avoidance of environmental integrity risks, avoiding the need to indefinitely sequester the carbon, and avoiding operational risks such as wildfires. Options include lowering the value of future forestry credits or decoupling forestry from the ETS. If the latter policy was chosen, it would be important to continue to incentivize afforestation given this has been an important and successful part of New Zealand's emissions reduction strategy. For instance, a feebate scheme could apply fees on deforestation and rebates for afforestation or changes in forest management that sequester carbon. Finally, incentivizing R&D, especially into technology to lower methane emissions from cattle and sheep such as switching to higher-productivity livestock, and enhancing livestock feed through additives (for example, seaweed), could lower mitigation costs and provide wider global externalities.[9]

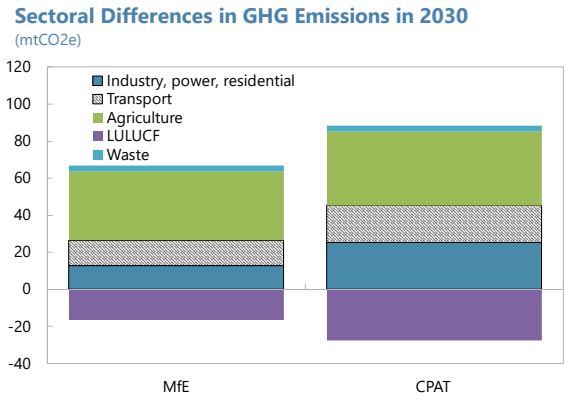
[8] For example, there is uncertainty given New Zealand's high marginal abatement cost, the non-linearities in availability of forestry credits, and the complexity of New Zealand's ETS.

[9] For more details on policies to cut methane emissions see Black et al. 2022. "How to Cut Methane Emissions". IMF Staff Climate Note

Box 1. Differences Between Emissions Estimates by CPAT and New Zealand's Ministry for the Environment Modelling

The Climate Policy Analysis Tool (CPAT) is a climate model developed jointly by the World Bank and IMF to estimate future GHG emissions and to consider counterfactual scenarios from changes in policy. The model works by first calculating energy consumption by sector and by fuel in the economy based on forecasted energy prices, GDP growth, and technological development using assumptions on price and income elasticities. Then it estimates emissions using sector-fuel-country specific emission factors (Black et al, 2023). The main differences in outcomes to those estimated by the Ministry for the Environment (MfE) can be broken into a) what is included in the baselines and b) different sectoral assumptions.

Different Baselines: CPAT accounts for pre-existing policies, whose impacts are already implicit in currently observed fuel use and emissions, including carbon pricing, regulations, and fuel taxes/subsidies, with the current level or stringency of these policies held fixed. It does not consider any announced changes in policies nor does it account for lagged impacts from current policies. Not including tightening of existing policies nor adding new policies allows the model to remove uncertainty over implementation of announced policies, as well as adds flexibility to layer and compare different combinations of policies. For example, CPAT includes New Zealand's ETS, but does not assume the cap on the number of ETS units will be reduced nor does it model an increase in sectoral coverage. By contrast, the baseline assumed by the MfE includes implemented and adopted policies, including stipulated strengthening of existing policies. This is built in the 'with existing measures' modelling scenario in accordance with UNFCCC reporting guidelines. For example, the December 2023 model includes the announced pathway forward of the ETS and based on policies in place as at 1 July 2023, some of which have now been discontinued by the current administration such as pricing agricultural emissions from 2025.



Sources: Ministry for Environment 2023 and IMF Staff Calculations

Examples of differences in sectoral assumptions:

- **LULUCF**: CPAT assumes that New Zealand will continue to act as a carbon sink but that the sector is unresponsive to major changes elsewhere in the economy. MfE takes a granular approach to modelling the sector and accounts for interactions with the agriculture sector. The ministry also uses a target accounting framework which does not include all forms of LULUCF.
- **Transport**: MfE assumes a higher rate of adoption of electric vehicles. This reflects both a more optimistic view on EV demand as well as policies in place on 1 July 2023 on EV subsidies which have now been reversed.
- **Industry, power, residential**: CPAT assumes no future tightening of the ETS setting whereas MfE assumes a rising ETS price. MfE's projections also assume scheduled closure of some heavy industries or their expected transition to renewable energy sources. Additionally, IMF estimates are more conservative on assumptions for technological progress in the sector, whereas New Zealand's projections incorporate bottom-up assessments of decarbonisation investments in sectors such as steel manufacturing and food processing, based on modelling of the impact of the Government Investment in Decarbonising Industry Fund which ran from 2020 to 2023.
- **Agriculture**: MfE assumes agricultural pricing will start in 2025, i.e. government policy at the point when the projections were created (mid 2023). Agricultural pricing is not included in CPAT baseline.