

# INTERNATIONAL CONTAINER DEMAND FORECASTS

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Prepared for the Port of Melbourne

31 August, 2022



# Disclaimer

31 August 2022

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# Contents

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Introduction	<b>04</b>
Baseline - Forecasts and Methodology	<b>07</b>
Sensitivity Analysis - Approach	<b>15</b>
Sensitivity Analysis – Container Imports	<b>17</b>
Sensitivity Analysis - Transhipments	<b>22</b>

# Introduction

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# Purpose

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## Scope of the work

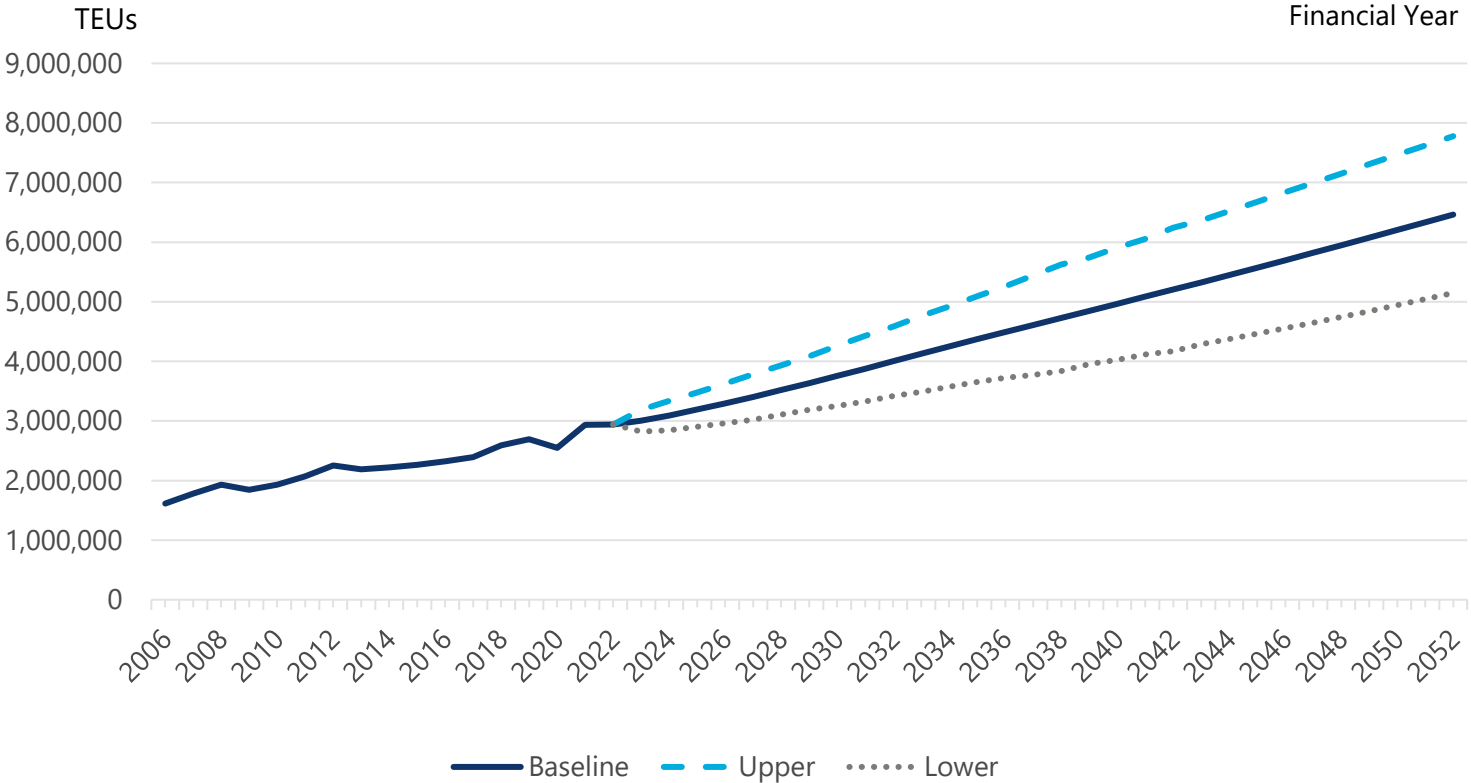
To support the Port of Melbourne's long term infrastructure planning, BIS Oxford Economics has been engaged to develop a forecast of container demand and sensitivities around the central forecast. These are designed to reflect a reasonable range of possible future outcomes for containerised trade volumes through the Port of Melbourne over the period from FY22 to FY52.

The sensitivity analysis focuses on containerised imports and related trade volumes – empty containers and transhipments. Other trade volumes have not been changed as part of this analysis.

Note: These forecasts were produced to reflect the state of the world as of May 2022.

# Summary – Outputs

BISOE assessment of feasible set of alternative outcomes for total container trade at the Port of Melbourne



The upper and lower bounds reflect a ~20% variance around the baseline by 2052. This is consistent with a 50% confidence interval.

Within the bounds, the range of possible outcomes reflect varying degrees of economic growth, multipliers and transhipments.

In compound annual growth rate (CAGR) terms, the baseline forecast is for 2.6% growth on average from FY21 to FY52.

The upper bound reflects 0.6% higher CAGR than baseline, while the lower bound CAGR is 0.8% lower than baseline.

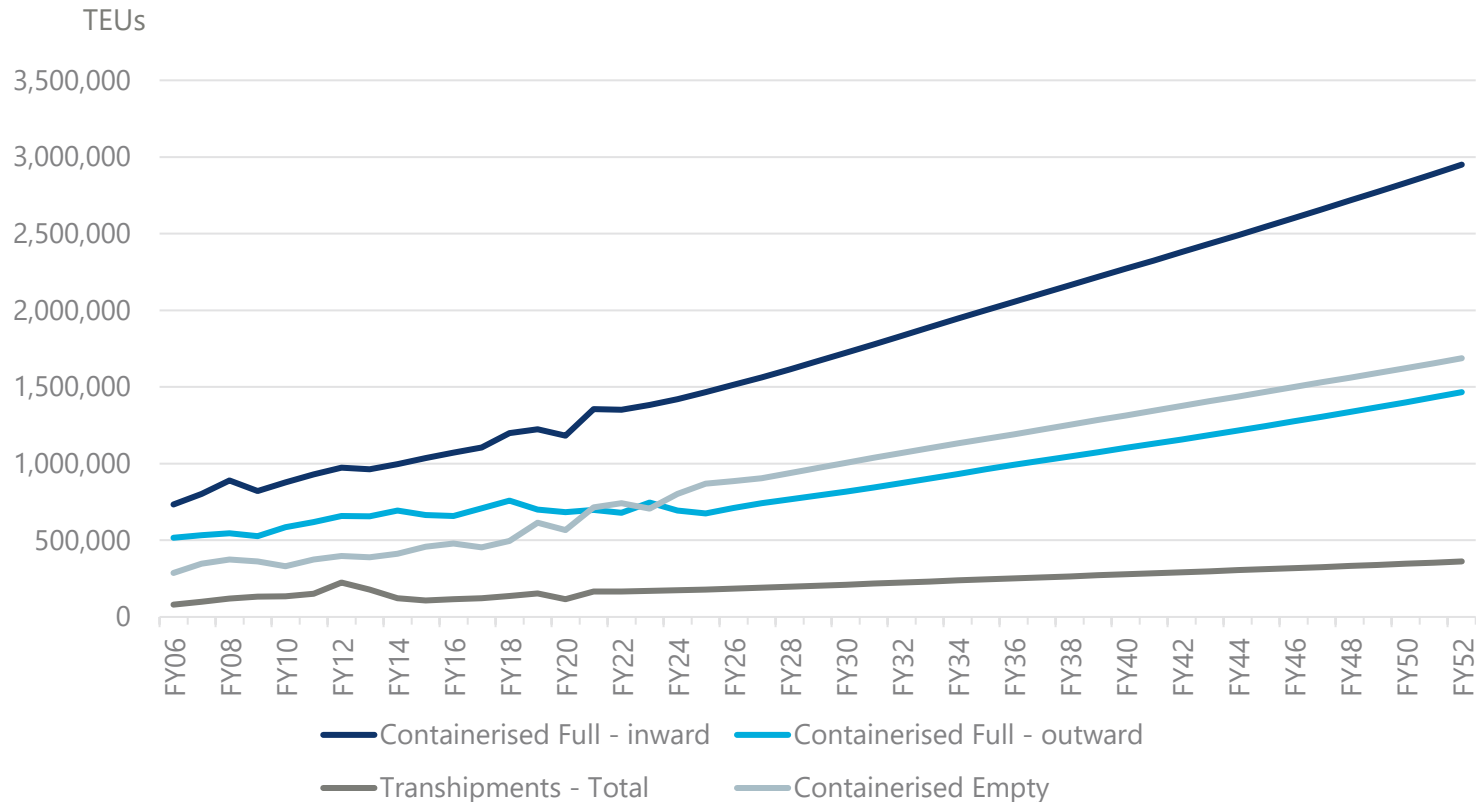
Total container trade is the total of container imports, container exports, empty containers, full transhipments and empty transhipments. Bass strait and non-containerised cargo have been excluded from the analysis.

**Baseline**

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# Baseline - Summary

## Container Volumes – Baseline – Port of Melbourne



## Baseline Results

In our baseline forecasts, the total container trade is forecast to grow at 2.58% CAGR from FY21 to FY52. This compares to a 4.05% CAGR between FY06 and FY21.

## Baseline Methodology - Summary

To forecast trade volumes, BISOE has custom-built a structural econometric model, which decomposes trade into different categories and forecasts volumes for each category based on estimated relationships between trade volumes and their underlying microeconomic and macroeconomic drivers.

Further details on the methodologies of each category are provided in subsequent pages.



# Container Imports - Methodology

## Container Imports are modelled using key economic and demographic drivers

For container imports, BISOE looked at seven distinct import classes which cover almost all TEU volumes. Of these, three are considered to be consumables, one as a capital good, and the remainder intermediate goods.

The three consumer categories are:

- **ICA** – food and beverages predominately for household consumption,
- **IC4** – non-food household consumables,
- **IOA** – parts required for the continued operation of motor vehicles (mostly tyres).

The capital goods category include:

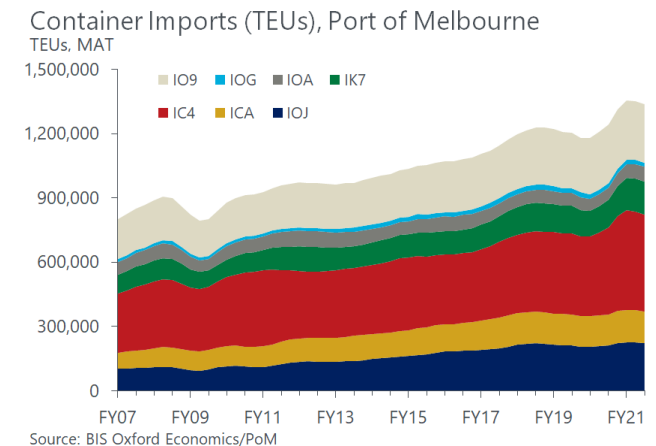
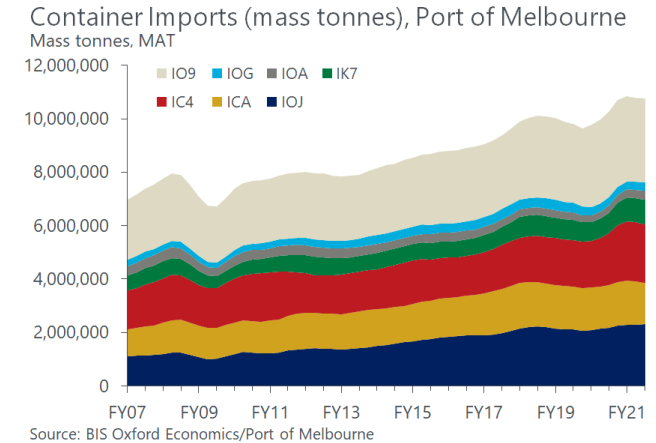
- **IK7** – containerised machinery and equipment and select intermediate goods (parts for machinery and equipment, and heavy motor vehicles requiring final assembly).

The intermediate goods include:

- **IOJ** – building materials
- **IOG** – steel
- **IO9** – other intermediate goods.

For each of these commodity groupings, BISOE has estimated the long run relationship between the dominant macroeconomic or demographic factor and the mass of imports at a national level, with further consideration given to the trends in the composition of imported cargo by container sizes and the implications of this will have on TEU volumes distinct from that of the mass of the cargo itself. Furthermore, as the distribution of trade into the country can evolve over time, an assessment of the prospects at each port is considered incorporating trends in dispersion/ concentration among ports for that trade and the demand outlook in the hinterland vis-a-vis the national profile.

Note: MAT refers to moving annual total (rolling 12-month sum).



# Container Imports – Methodology (cont.)

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- The macroeconomic models used by BISOE are re-calibrated monthly, based on newly available data. For most macroeconomic indicators, new data is made available on a monthly basis. Demographic data is a slower process with quarterly releases from the ABS, although it is generally a much slower moving variable thus its less timely release is less of a concern. The trade models are recalibrated half-yearly.
- BISOE checks current forecasts against previous forecasts and changes are logged explaining reasons for changes to the outlook and makes some adjustments to the raw data with a suite of aggregations which align to the categories observed.
- These include:
  - measures of construction (using work done or gross capital formation) which best align with the trade volumes observed
  - retail activity (using retail turnover categories) which best align with the trade volumes observed
  - merchandise import volumes allocated to seven broad groupings
    1. food and beverages for human consumption,
    2. consumer goods,
    3. motor vehicle parts,
    4. capital goods and parts,
    5. processed industrial goods,
    6. iron and steel,
    7. other intermediate goods).
  - These have been calibrated using ABS definitions of end use categories (using Balance of Payments Broad Economics Categories) and have excluded goods which are predominately bulk (using the Port of Melbourne's own trade statistics).

# Full Container Imports – Bottom-up outlook

Total TEU forecasts are generated by summing growth within each trade category.

## Consumer Goods

**34%** (of 2021 full direct imports)

At the national level, imports (*mass tonnes*) per million dollars of non-food retail turnover has flatlined post-GFC. However, through COVID-19, mass tonnes per dollar spend has increased sharply as the consumption mix has shifted towards goods (clothing, footwear, furniture, electronics) while overseas travel and social activities has been curtailed.

This shift towards goods consumption will be temporary, and we expect consumption will rebalance toward services. This process has tentatively started on a couple of occasions, only to be thwarted by lockdowns. High vaccination rates and a booster program well underway has ameliorated some of the risk of returning to strict lockdowns that could undermine this rebalancing.

Melbourne's market share for consumer goods imports (as a share of national consumer good imports) has drifted up gradually from 35% to 41% since FY16. Port of Melbourne's market share to remain at its current levels over the forward outlook, having lifted in recent years.

## Other Intermediate Goods

**20%**

Other intermediate goods has exhibited low growth over the last three decades, with mass tonnes per unit of GDP declining consistently. Although the intensity factor has declined in recent years, it is projected to remain flat over the forward period.

Internationally, strength in intermediate goods imports is highly correlated with economic cycles due to their use in manufacturing, but through COVID import volumes were supplemented by unusual surges in plastic, plexiglass, and cleaning products.

The Port of Melbourne's market share has steadily climbed since its low in 2011 at 17%, reaching 28% in by the end of 2021. Over the forward outlook, its share is expected to increase modestly as Victoria's share of population rises, reaching 30% by 2050.

## Processed Industrial Supplies

**17%**

Imports of processed industrial supplies, largely reflecting building materials, has lifted sharply through the pandemic. This largely reflects an upturn in the residential investment cycle, induced by HomeBuilder and other incentives. However, acute material and labour shortages are set to persist all the way through 2022, causing project delays and sustaining a high rate of construction cost inflation. This means that the activity is anticipated to hold at an elevated level for an extended period, as builders work through the substantial backlog of work to be done.

A second smaller peak in growth in building material imports is anticipated around FY23 as apartment construction growth begins to gather pace while the backlog of detached housing investment is worked through.

Longer term, processed industrial supply imports now includes a trend component, with growth in mass tonnes per dollar spent on building construction activity growing at around 0.8% p.a. CAGR with pace gradually slowing over time. This trend was externally validated against the international experience of processed industrial supply import relative to dollar spend in building activity.

After increasing through FY14 and FY15, the Port of Melbourne's share of national imports has broadly stabilised since 2016. Given the current residential investment upturn is widespread across the nation, we expect similar stability over the outlook with Melbourne's market share increasing only half a percent to 14% by FY50.

# Full Container Imports – Bottom-up outlook (continued)

Total TEU forecasts are generated by summing growth within each trade category.

## Capital Goods

**12%** (of 2021 full direct imports)

Capital good imports have grown sharply through the COVID-19 pandemic. Strong incentives from the Federal Government provided firms with strong incentives to undertake machinery and equipment investment (M&E), given the expanded instant asset write-off scheme allows firms to deduct the entire cost of qualifying assets.

After a stronger period for M&E expenditure and weaker period for building and structures, the near-term is expected to see investment rebalance towards more normal share of investment. This is confirmed in firms' estimates of forward CAPEX for FY22 (after adjusting for historical realisation rates). This is expected to translate into slower growth in capital goods imports, following eighteen months of robust growth. Beyond FY22, growth is expected to re-adjust back towards more balanced growth profile for Victorian M&E expenditure.

The 20ft share of containers has been declining, which will continue over the forward outlook albeit at a slower rate. This contributes positively to TEU growth over the outlook.

After gradually declining post-GFC, Melbourne's market share has climbed from a low of 15% in FY15 to just above 20% at the end of the 2021, although with a moderate degree of volatility. Over the outlook, its market share is forecast to increase marginally to 21% by FY50.

## Food & Beverages

**11%**

The Port of Melbourne's market share has gradually declined from 41% in 2009 to 35% in 2021. Its market share is projected to slowly rise back to 37% by FY50 as Victoria's share of population increases.

Post-GFC, imports of food and beverage per capita nationally (in mass tonnes) have increased around 2% p.a. Imports per capita are projected to continue increasing over the forward outlook at a similar pace.

The 20ft share of containers has declined by around 3% p.a. since 2009. This shift is maintained over the forecasts, although with the pace of declines moderating. Ultimately, the continued shift adds to growth in TEUs.

## Parts for Motor Vehicles

**5%**

Forecasts for motor vehicle parts (chiefly lead acid batteries and tyres) are forecast to grow in line with underlying population growth of Australia, as the stock per capita is projected to hold at approximately the same level.

National imports rose through the pandemic. Disrupted supply chains of motor vehicles globally impeded the ability of households to purchase new cars. Sharply rising imports of parts may reflect households' running their current cars for longer as a result and thereby requiring new components (particularly those conducive to wear i.e. tyres).

In the ten years preceding the COVID-19 pandemic, Melbourne consistently lost market share of motor vehicle parts imports from 56% in 2009. Since 2019, market share has lifted marginally from 30% to 31%, where it is expected to gradually lift to 33% by FY50 as Victoria's share of the population increases.

## Iron & Steel

**1%**

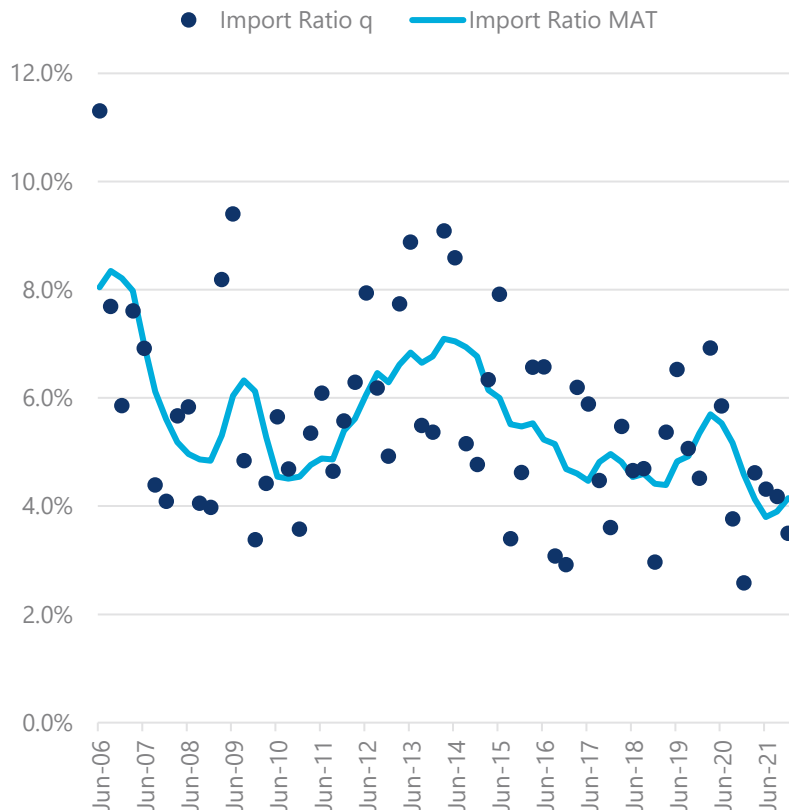
Iron and steel imports have been pulled out of other intermediate goods, and are now driven by a combination of Gross Value Added (GVA) in manufacturing and construction due to its respective roles as intermediate goods in the production process.

Melbourne's share of iron and steel imports is relatively small at around 2%. In the decade preceding the pandemic, its market share steadily climbed from 1.5% to as high as 3%. Subsequently, it has pulled back through the pandemic to 2.3% as of end of 2021, where it is forecast to remain over the forecast period.

# Empties (excl. Bass Strait)

COVID related disruptions have now unwound

## Empty to Full Export Ratio



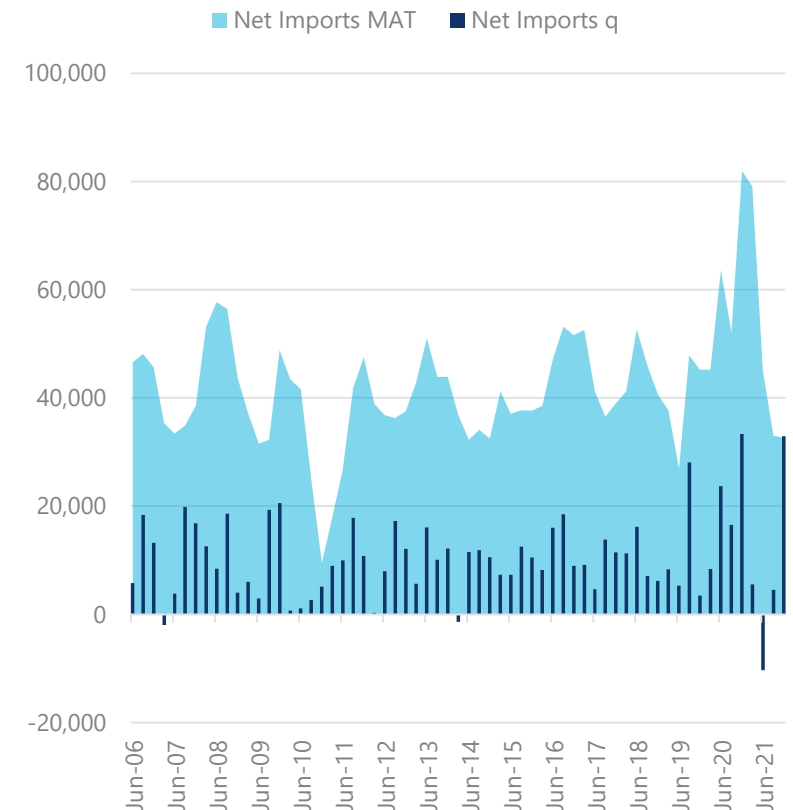
## Methodology

Empty imports are calculated as a % of total full imports. Currently, these amount to 4.1% of all imports.

Empty exports are calculated using a difference between the total imports (i.e. full imports and empty imports) less the full exports and **net imports** (i.e. total imports less total exports).

Recent deviations from the long-run average net import levels are seen as temporary due to a host of supply chain issues, and have been unwound during FY22.

## Net Imports

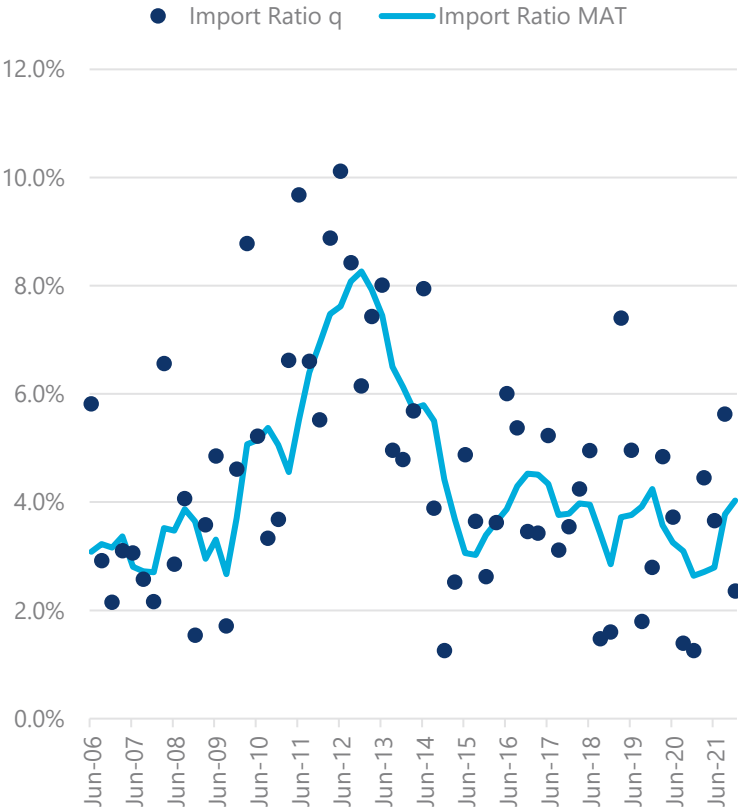


MAT refers to moving annual total (rolling 12-month sum). Q or q, refers to quarterly.

# Transshipment

Transshipments are calculated in a similar manner to empties.

## Tranship Empty to Direct Empty

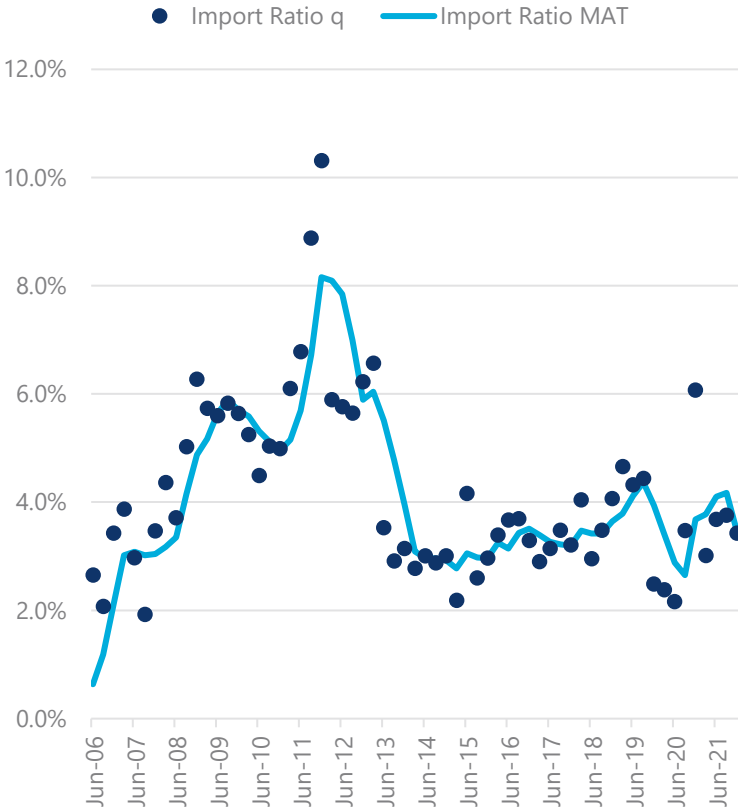


## Methodology

Import and export transshipments average to be the same each year, and full and empty volumes are calculated as a share of the dominant direction of trade (i.e. full imports and direct empty).

Recent increases in transshipments have been assumed to be permanent adjustment in market share, translating to market share holding at a higher level.

## Tranship to Direct Import Ratio



MAT refers to moving annual total (rolling 12-month sum). Q or q, refers to quarterly.

# Sensitivity Analysis

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# Overview

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## BISOE's preferred approach for assessing long-term container volumes

### General approach for modelling

In assessing the future long-term demands for container volumes at the Port of Melbourne, BIS Oxford Economics has adopted a wholistic long-term approach which looks at all container volumes through the Port.

There are three different aspects to international container freight which will be examined in sequence:

- (1) Direct Imports = (1a) Full imports + (1b) Empty Imports
- (2) Direct Exports = (2a) Direct Imports – (2b) Net Imports
- (3) Transhipments = (3a) Tranship Imports + (3b) Tranship Exports

Note that Direct Exports are not modelled directly, rather as a difference between Direct Imports and Net Imports, as the Port of Melbourne's dominate full container flow is inbound. Furthermore, the variance on (2b) Net Imports is small, and is therefore excluded from the sensitivity analysis.

As a result, we only explicitly consider sensitivities to container imports and transhipments, with empties calculated implicitly and container exports unchanged.

### Assessing appropriate uncertainty bands and sensitivities

In general, the approach for assessing appropriate sensitivities for each of the explicitly considered container categories – full container imports and transhipments – has been to determine what one might reasonably expect the range of possible outcomes to be.

For container imports, possible outcomes can be influenced by several different factors, such as different economic conditions or rates of import penetration. Here we have sought to determine what possible outcomes would be feasible amongst these contributing factors, before combining them to form alternative trajectories for container imports.

Similarly for transhipments, we have sought to determine a range of possible outcomes for the size of transhipments compared to full container imports.

After determining upper and lower bounds for these categories of container trade, the empties trade can be calculated – with exports and net imports assumed to be unchanged – to determine a set of feasible upper and lower bounds for the total container trade at the Port of Melbourne.



# Sensitivities - Container Imports

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# Full Imports

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Full imports are modelled using a two step approach

For scenario modelling, BISOE considers two sensitivities:

1. Economic Growth
2. GDP Multiplier

Long-term differences in **Economic Growth** are assumed to apply equally to Australia (via GDP) and the State of Victoria (via Gross State Product, or GSP). The scenario models are agnostic as to whether this is via changes in the population outlook, or via changes in long-run productivity.

For the **GDP Multiplier**, BISOE uses the forecast change in the ratio of mass tonnes to Victorian GSP developed in the Baseline bottom-up assessment as the central outlook, and from there considers alternative top-down cases based on cross-country analysis.

## Containerisation

While containerisation is a key explanatory component of the growth in TEUs above that of imports in mass tonnes, differences from the baseline have been excluded from the scenario modelling.

Containerisation includes changes in mode (from bulk to/from container) as well as changes in the composition of container (i.e. 20ft vs 40ft ISO containers). For exports, the mode change has a material impact on container growth, whereas for imports, it is the shift between 20s and 40s.

As a general rule, the growth in import 40s have vastly outpaced that of 20s, and the mass/TEU exhibits a clear difference between the two container types (but it is consistent over time). All scenarios consider a continuation of the trend towards 40s, which have been observed at all of the major east-coast container ports.

## Market share

We have assumed Port of Melbourne's market share remains unchanged from baseline and therefore has been excluded in the sensitivity analysis.

If its market share were to deviate from baseline – either to the upside or downside – we may expect the upper or lower bounds to change.

# Economic Growth

Long-term models of economic growth generally use an additive approach

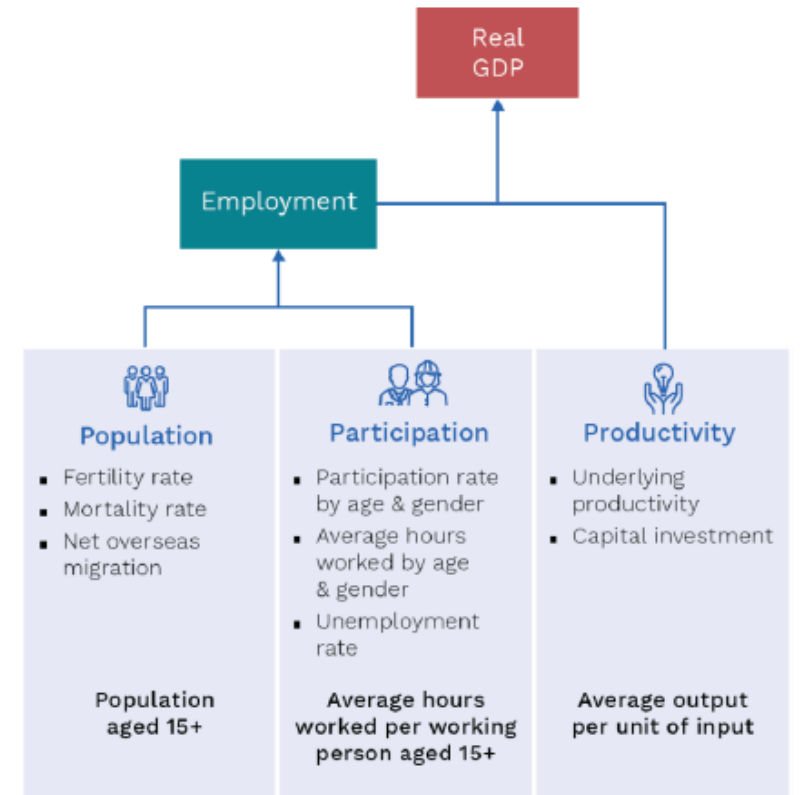
*Potential real GDP*

$$= \text{population (15+)} \times \text{participation rate} \times (1 - \text{NAIRU}) \times \text{avg hours worked} \times \text{productivity}$$

Common sensitivities are typically around population (on the upside) and on productivity (on the downside), with the combined impact of both representing a standard deviation of 0.3% p.a. (over 30 years, this accounts for a range of  $\sim \pm 10\%$ ).

The shape of the uncertainty band is assumed to have the standard deviation increasing at a decreasing rate, converging to the  $\sim \pm 10\%$  range over the medium term. This is consistent with uncertainty in the forecast increasing over term, albeit with the convergence in growth outcomes over longer periods.

For example, the recent discussions by the Federal Treasury department about changes to skilled migration flows mooted to be discussed at the upcoming jobs and skills summit and captured in the forthcoming October Budget represent growth circa 0.2% to the upside on a per annum basis from previous Treasury assumptions, whereas the lower labour force productivity measurements reflect a decline of 0.3% to the downside in the federal outlook. These alternative forecasts are consistent with the assumed uncertainty band.



<sup>1</sup> **NAIRU** – non-acerating inflation rate of unemployment. The NAIRU is the lowest unemployment rate that can be sustained without causing wages growth and inflation to rise, and is in essence the long-term sustainable capacity of the labour force. <https://treasury.gov.au/publication/2021-intergenerational-report>

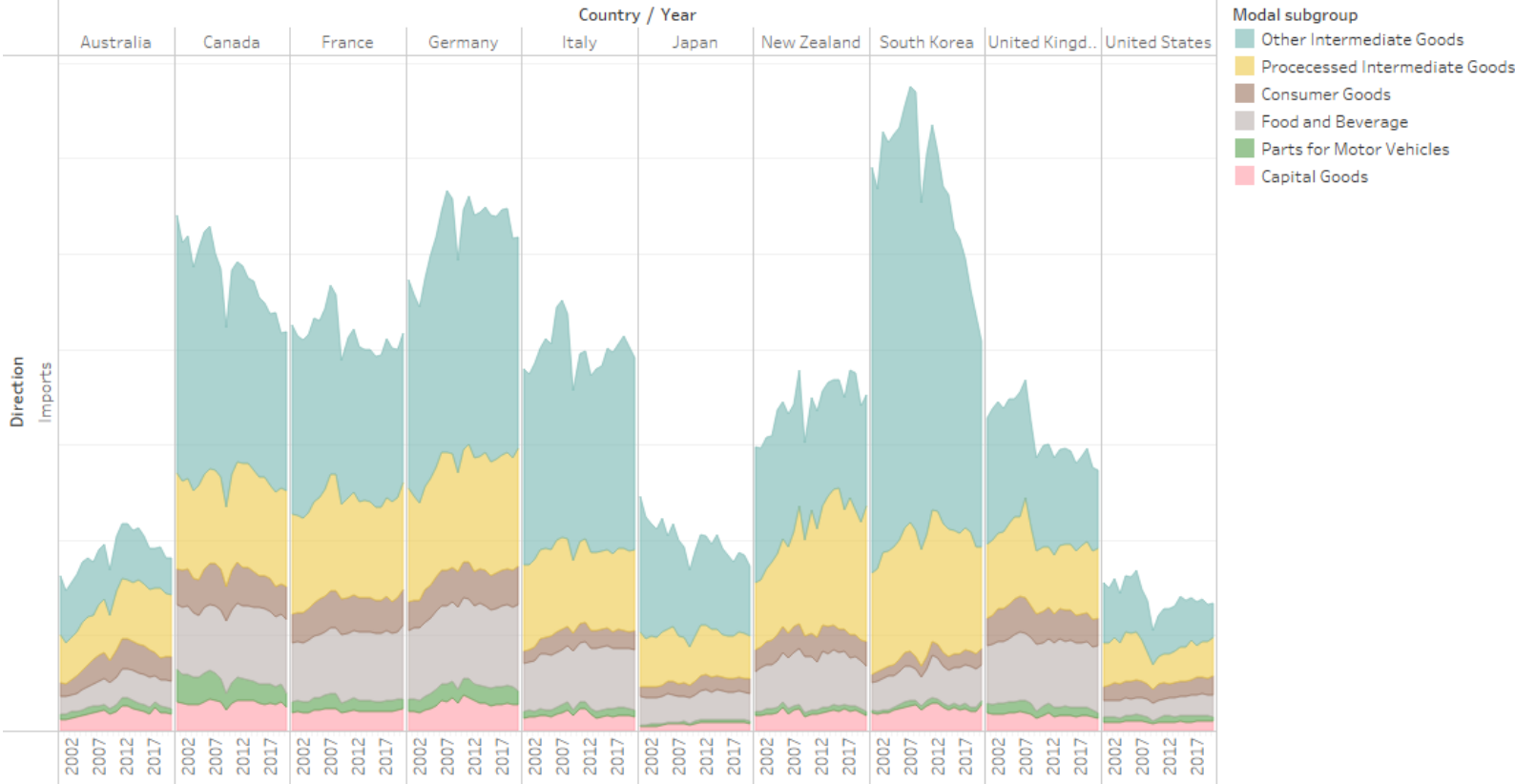
# GDP Multipliers

## Tonnes per Unit of GDP (USD PPP)

BIS Oxford Economics has developed a cross-country comparison of containerised trade using a discrete list of Harmonised Codes<sup>1</sup> which are predominately moved via unitised cargo.

Looking at select developed countries, there is a wide range of intensities and change over time in the ratio of unitised cargo as a share of GDP. However, a number of broad observations may be made:

- Intermediate goods (i.e. building materials and inputs into manufacturing) are the dominant import cargo for the selected countries.
- Over the past two decades, the ratio of unitised imports to GDP within each country have not been uniform or unidirectional, but rather have covered a spectrum of  $\pm 3\%$  from a base year.



<sup>1</sup> Harmonised codes is the six-digit standard for classifying globally traded products, administered by the World Customs Organisation. <http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx>

# GDP Multipliers

## Methodology for understanding risks around the GDP multiplier

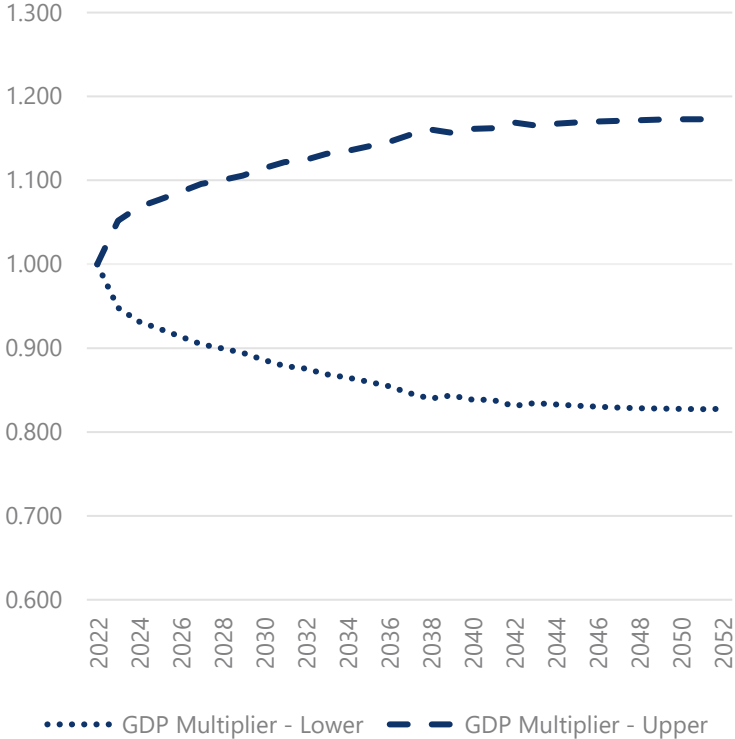
The approach we take to understanding the risks around GDP multiplier as to be applied over the forecast horizon is detailed below.

Firstly, we use a set of 27 comparable economies, that span most of the OECD and with a sample stretching from 2000 to 2020. Using this sample of economies and years, we calculate all growth rate combinations in the ratio of unitised import volumes to GDP i.e. all single year growth, all two-year growth....up to 20-year growth. Here the increments of growth are between 1 and 20.

From here, we are able to estimate standard deviations for all lengths of growth rates across the cross section of economies in the comparable set. This enables us to fit an equation to help understand how the distribution of growth outcomes evolve between single year increments to longer year increments. The rationale for this is to be able to understand the shape of the 'forecast uncertainty' around the GDP multipliers i.e. constantly increasing uncertainty bands or increasing exponentially or increasing at a decreasing rate.

We observe that the variation in growth outcomes increases as the growth increment increases albeit at a declining rate. Importantly, this result defines the shape (concave) and the width of the upper and lower bounds. At a 50% confidence interval, we would expect the import volumes to GDP ratio to fit between  $\pm 17%$  by the end of the forecast horizon.

Ratio of upper/lower to baseline



# Transhipments

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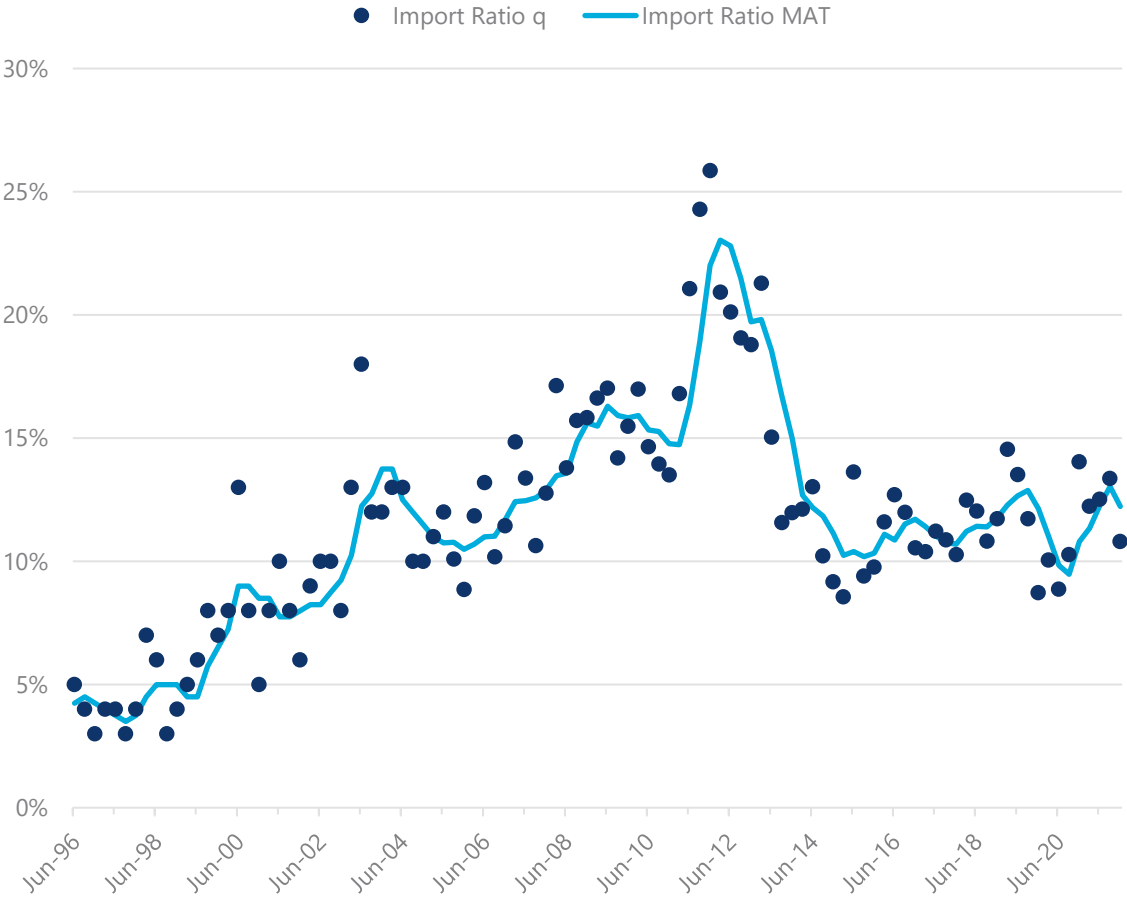
# Transhipments

Transhipments are modelled on the dominant direction of trade i.e. full direct container imports

Import and export transhipments average to be the same each year, and full and empty volumes are calculated as a share of the dominant direction of trade (i.e. full imports and direct empty).

Transhipments as a share of full container imports has fluctuated within a much tighter range since 2014, with a mean of 11% of full direct container imports.

Over the period, the standard deviation of the ratio was 0.9%. Over the full sample however, transhipment has moved in a wider range. In 1996, transhipments were only around 5% of full container imports before gradually trending towards a peak of 23% in 2012 and subsequently falling back towards 11% where it has broadly remained since. Using the full sample, the standard deviation of the ratio of transhipments to full direct imports is 4.3%.



MAT – Moving annual total i.e. sum of preceding four quarters (or preceding 12 months)

# Transhipments

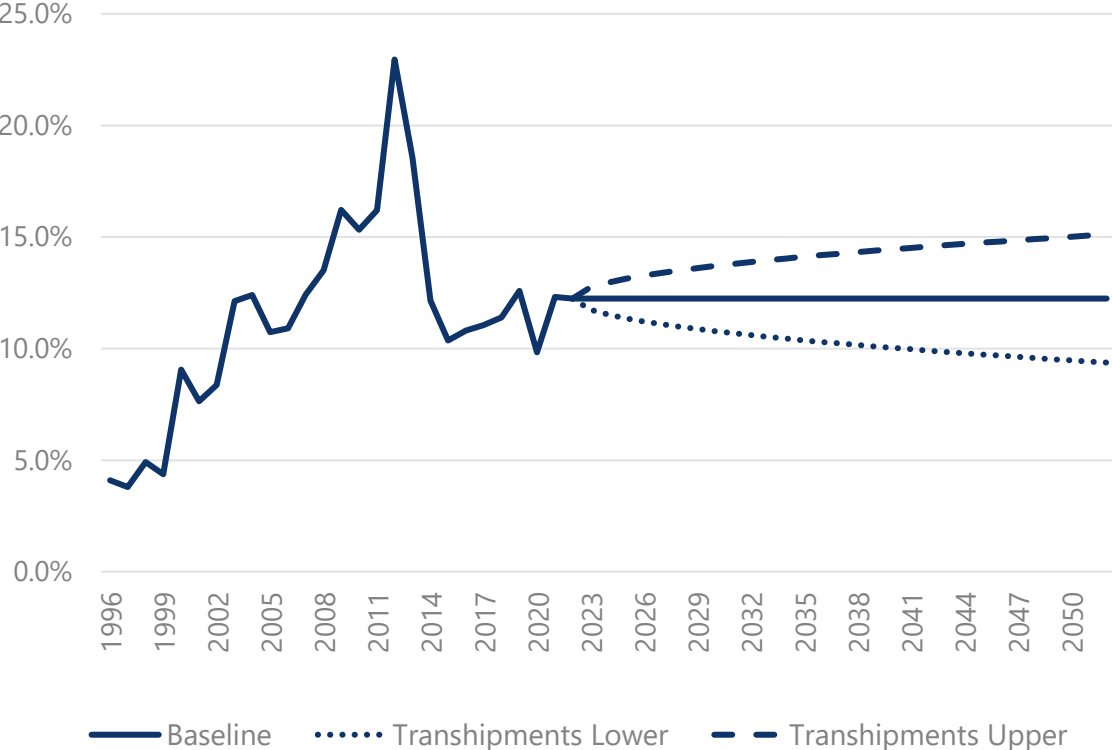
Transhipments are modelled on the dominant direction of trade i.e. full direct container imports

Over the forecasting horizon, we utilise the narrow standard deviation (estimated post-2014) in the short term before increasing towards the full sample standard deviation (estimated 1996 to 2021). The standard deviation increases at a decreasing rate<sup>1</sup> as it converges to 4.3%.

Using this profile for standard and the critical value for a 50% (two-tailed) confidence interval, the ratio of transhipments to full direct would fluctuate at the most  $\sim \pm 1.8\%$  either side.

Importantly, the implications of different full container imports impacts transhipment volumes through this ratio. If the ratio of transhipments is constant but container import volumes were higher or lower, transhipments would be different. Similarly if container import volumes were unchanged but the transhipment ratio deviated from baseline, transhipments would also change. Therefore, the uncertainties from container imports volumes has a multiplicative relationship to transhipments.

Ratio of transhipments to full direct imports



<sup>1</sup> The standard deviation increases at a decreasing rate over time, according to a fitted logarithmic curve that has been estimated according to how the standard deviation of the transhipment to direct full imports ratio has evolved over the history.